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WASTEWATER/STORM WATER CHARACTERIZATION AND TOXICITY IDENTIFICATION EVALUATION, SHEPPARD AIR FORCE BASE, TEXAS

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A wastewater characterization survey was conducted at Sheppard AFB TX from 22 April 1991 to 3 May 1991 by personnel from the Water Quality and Environmental Biology Functions of Armstrong Laboratory. Quantitative Data were also collected during a rain event to assess the quality of the storm water runoff from Sheppard AFB. Biomonitoring of the influent and effluent to the Wastewater Treatment Plant (WWTP) was also performed to identify the toxic fraction(s) in the wastewater causing periodic failures in biomonitoring. A qualitative odor survey was also performed to determine if the source of a pungent, onion-like odor could be identified.

Measurable concentrations of industrial solvents were found in the wastewater, indicating that some industrial wastes are entering the sanitary sewer system. Phenol concentrations greater than the permitted 50 micrograms per liter were found in many of the sampling sites. The toxic fraction identified in the WWTP influent was an organic electrophile, possibly a petroleum hydrocarbon, oil, grease, or surfactant. The identity of the odor was not conclusively determined, but solids lying in the manholes are thought to be decomposing and emitting noxious gases.

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The authors greatly appreciate the hard work and bravery shown by the members of this team throughout this survey, but especially during the storm water sampling. Despite snakes, lightning, and funnel clouds, the team members vigilantly collected the necessary samples and data. We applaud this "can do" attitude.

We would also like to thank all personnel in the Bioenvironmental Engineering Services and Environmental Coordinator's Offices for their assistance in this survey.

WASTEWATER/STORM WATER CHARACTERIZATION AND TOXICITY IDENTIFICATION EVALUATION, SHEPPARD AIR FORCE BASE, TEXAS

INTRODUCTION

A wastewater characterization survey was conducted at Sheppard AFB from 22 April 1991 to 3 May 1991 by personnel of the Water Quality and Bioassay Functions of the Armstrong Laboratory. Quantitative data was also collected during a rain event as background information for assessing the quality of their storm water runoff. Biomonitoring of the influent and effluent to the Wastewater Treatment Plant (WWTP) was also performed to identify which toxic fraction(s) were causing samples from the Plant's effluent to fail biomonitoring testing periodically. A qualitative odor study was also performed to determine if the source or compound causing a pungent, onion-like odor throughout the base could be identified.

This survey was performed in response to a request from the Air Training Command Bioenvironmental Engineer (ATC/SGPB) to perform wastewater characterization surveys at all ATC bases. The request letter is at Appendix A.

Armstrong Labora. ry personnel performing the survey included Capt Richard McCoy (Team Chief), Capt Robert O'Brien, Capt Alan Holck, 1st Lt Darrin Curtis, 2d Lt Anita Thompkins, TSgt Mary Fields (Team NCOIC), SSgt Pete Davis (Team Administrator), A1C Patanya Garrett, and Amn Keanue Simmons.

DISCUSSION

Background

Sheppard AFB, the home of the Sheppard Technical Training Center (STTC), is located at the northern boundary of Wichita Falls, Texas. The mission of the base is to conduct undergraduate pilot training for United States and other North Atlantic Treaty Organization (NATO) pilots, and technical training for aircraft maintenance, Civil Engineering, and medical personnel, among others. Major units belonging to the STTC include the 80th Flying Training Wing, the 3700th Technical Training Wing, the 3750th Air Base Group, and the STTC Regional Hospital.

The base has approximately 14,000 personnel assigned at any given time. Approximately 6,000 of these personnel are students. The base maintains over 1,000 military family housing units and approximately 1,600 on-base dormitory billets.

Wastewater Characterization Survey

Wastewater treatment is accomplished with primary and secondary treatment. A primary clarifier collects solids which are pumped to an

anaerobic digester. Secondary treatment is accomplished with two trickling filters operating in series. Prior to discharge, the effluent is chlorinated, dechlorinated (using sulfur dioxide), and aerated in an aeration pond. The effluent is discharged into an unnamed tributary of Plum Creek. Plum Creek discharges into the Wichita River, which is a tributary of the Red River.

Permit Standards

The discharge from the WWTP is regulated by a National Pollution Discharge Elimination System (NPDES) Permit. A copy of this permit is contained in Appendix B. The WWTP effluent is designated as Outfall 001. Additional sampling required by the permit is designated as Outfall 101 and consists of a composited sample taken from industrial areas throughout the base. In the past, eight sampling sites were used in collecting the composite, but recently the number of sites has been reduced to four with the closure of many drainage lines. Also shown in Appendix B is an attachment to the NPDES Permit that mandates additional sampling and more stringent discharge limitations. This additional sampling was promulgated by the State of Texas.

Sampling Strategy

During a presurvey conducted at Sheppard AFB from 19-22 Feb 91, the sampling protocol that had been developed by Capt McCoy was reviewed with base Bioenvironmental Engineering Services (BES) and the Environmental Coordinator. Sixteen sites had originally been chosen in the strategy. These locations were selected to give us an overall assessment of the base's wastewater quality. The Environmental Coordinator requested an additional ten sites be sampled, and these were added to the strategy. The final strategy was then forwarded to the base (see Appendix C). Several changes were made to this strategy after it was made final. These changes include:

1. Additional sampling for pesticides at Sites 7 and 11. This analysis was added because the Entomology School is near these sites.

2. Sampling for ammonia and cyanide, Site 2. These analyses were added because the Nondestructive Inspection (NDI) Shop discharges near this site.

3. The addition of a site to monitor the discharge from the Wichita Falls Municipal Airport, Site 27.

A map showing the sampling locations monitored during this survey is in Appendix D.

Sampling Methods

Wastewater samples were typically collected over a 24-hour period as a time-proportional composite (i.e., a composite of 24 samples collected at 1-hour intervals). The automated composite sampler contains a 3-gallon glass jar which was packed in ice before each day of sampling. The jars were

replaced with clean jars each day. Samples for volatile organics, oils and greases, total petroleum hydrocarbons, total toxic organics, and pesticides were collected as grab samples. Figures 1 and 2 show typical procedures used during daily collection of samples.

The sample pH and temperature were recorded at the site each day a sample was collected. Any unusual visual characteristics (odor, color, etc.) of the composite sample or grab samples were also noted.

Samples were then placed in iced coolers and transported back to the workcenter (Wastewater Treatment Plant Laboratory, Bldg 1392) for preservation and/or refrigeration until shipment to the analytical laboratory. Samples were preserved in accordance with the AFOEHL Sampling Guide, March 1990. Table 1 lists the analyses and preservation methods used for the samples taken during this survey.

Field Quality Assurance/Quality Control (QA/QC)

A field QA/QC program was used during this survey to verify the accuracy and reproducibility of laboratory results. This program involved collecting field blank and duplicate samples. Twenty percent of the samples taken during this survey were QA/QC samples. Samples sent for analyses were submitted to the labs as single-blind samples (i.e., the laboratory did not know which samples were QA/QC samples). The QA/QC results for the blank samples are shown in Appendix E. Results of duplicate samples for volatile organics, metals and miscellaneous analyses are shown in Appendixes F-H respectively.

Field Blank Samples. Field blank samples were collected at randomly selected sites using laboratory grade distilled water. These samples are as free of contaminants as possible and are preserved in the same manner as the normal samples. They serve as a check on the sample team's technique and the purity of the preservatives. The results of the field blank analyses are shown in Appendix E. These results showed negative contamination in all but one sample result. A volatile organic aromatic sample collected by Team 1 had slight contamination of toluene and xylenes. Since no preservative was used in the collection of this type of sample, contamination occurred either in the process of collecting the sample, or is the result of a laboratory artifact.

Duplicate Samples. Duplicate samples were collected as well-mixed samples taken from the 3-gallon collection jar (for composite samples) or from a well-mixed, rinsed stainless steel pitcher. These duplicates were taken at several sites that were randomly selected. Duplicate samples serve as a measure of precision, which is the agreement between a set of replicate measurements without assumption or knowledge of the true value.

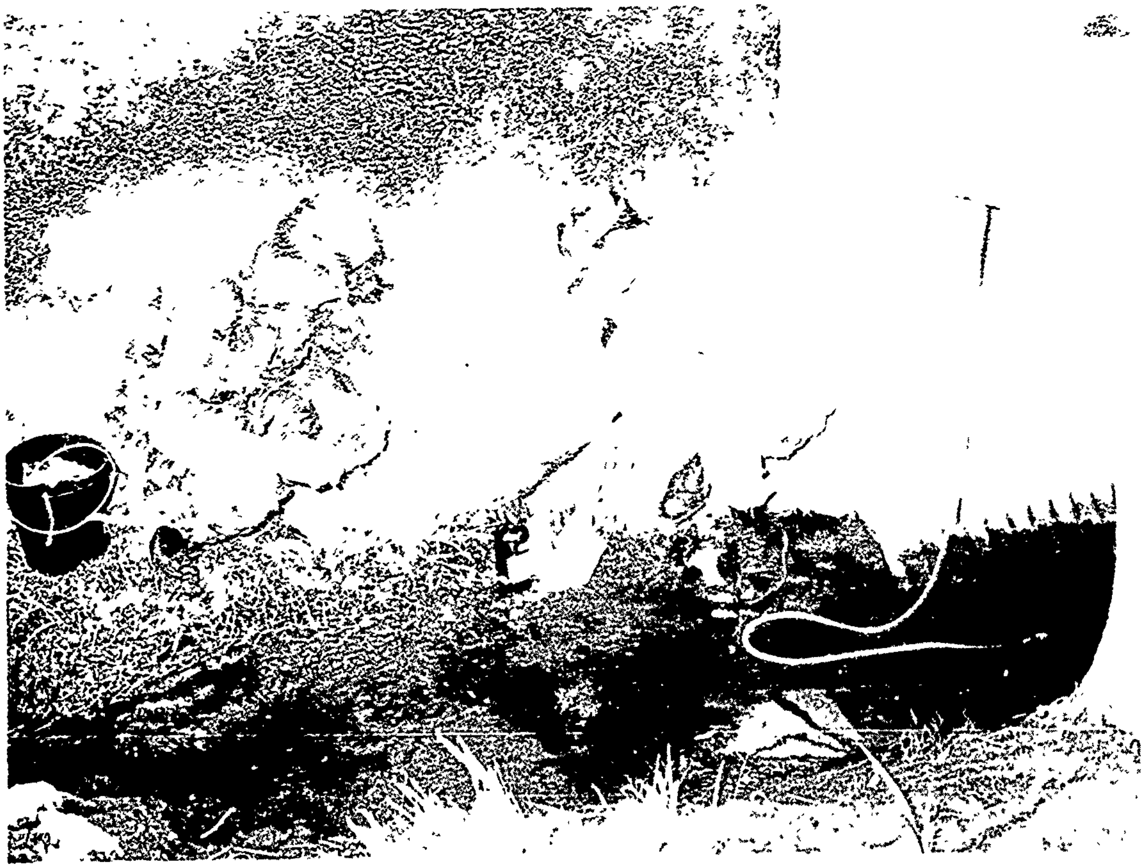


Figure 1. Typical sampling procedures at Site 22, WWTP Effluent.

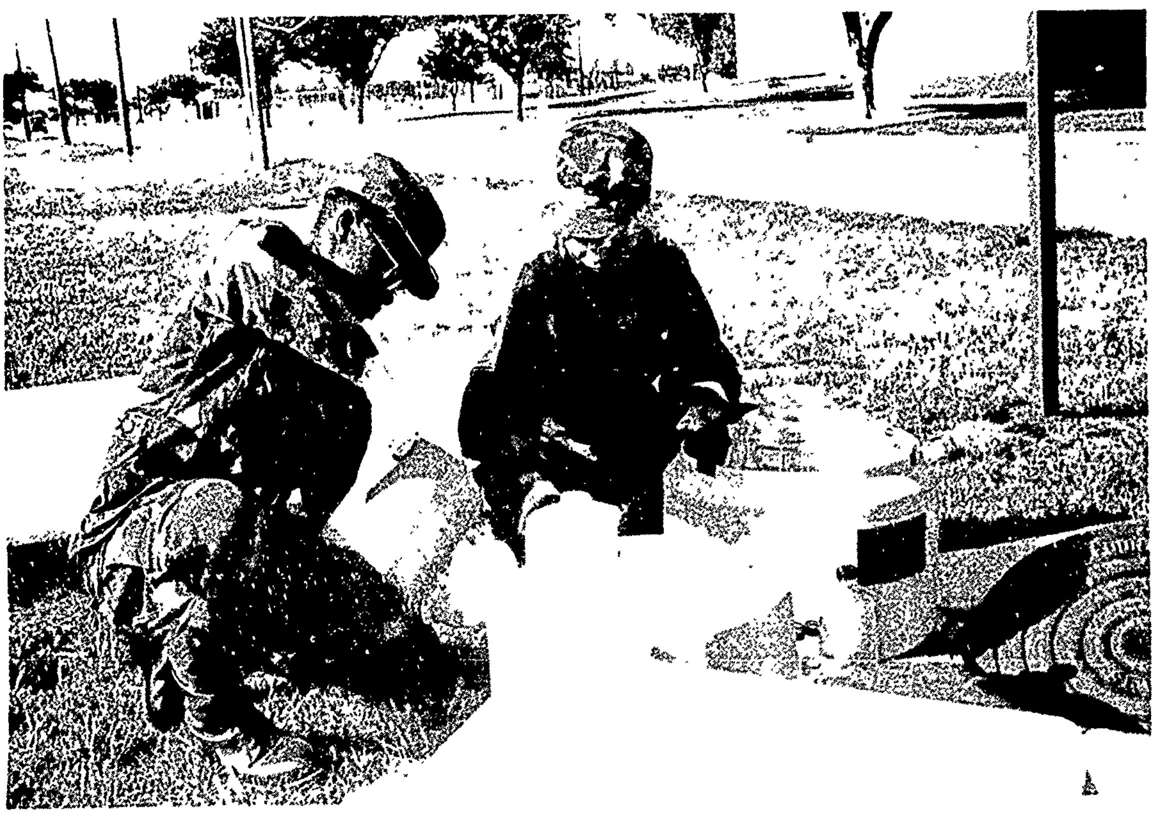


Figure 2. Typical sampling procedures at Site 16, Raytheon Battery.

TABLE 1. ANALYSES AND PRESERVATION METHODS

Analysis	Preservation	EPA Method	Holding Time (days)
Volatile Organic Aromatics (VOA)	4°C	602	14
Volatile Organic Hydrocarbon (VOH)	4°C	601	14
Metals			
Arsenic	HNO_3	206.2	180
Barium	HNO_3	208.1	180
Beryllium	HNO_3	210.2	180
Boron	None	200.7	180
Cadmium	HNO_3	213.2	180
Chromium, Total	HNO_3	218.1	180
Chromium VI	HNO_3	218.1	180
Copper	HNO_3	220.2	180
Iron	HNO_3	236.1	180
Lead	HNO_3	239.1	180
Magnesium	HNO_3	242.1	180
Manganese	HNO_3	243.1	180
Mercury	HNO_3	245.1	180
Molybdenum	HNO_3	200.7	180
Nickel	HNO_3	249.1	180
Silver	HNO_3	272.1	180
Zinc	HNO_3	289.1	180
Cyanide	NaOH	335.3	14
Ammonia	H_2SO_4, 4°C	350.1	28
Phenols	H_2SO_4, 4°C	420.2	28
Oils & Grease	H_2SO_4, 4°C	413.2	28
Phosphorus, Total	H_2SO_4, 4°C	365.1	28
Surfactants, MBAS	4°C	425.1	2
Hydrocarbons, Total Petroleum	HCl	418.1	28
Total Toxic Organics*	4°C	624	14
Total Toxic Organics*	4°C	625, 608	7

* Analyzed by Contract Lab (Datachem. Salt Lake City, UT)

NOTE: 4°C = Chill to 4°C
NaOH = Sodium Hydroxide
HCL = Hydrochloric Acid
HNO3 = Nitric Acid
H2SO4 = Sulfuric Acid

Tables F-2, F-19, F-20, and F-23 show the results of duplicate samples for volatile organics taken on 27-29 April. Good agreement is shown for all volatile organics analyzed, except methylene chloride. Variability in the reported concentration of methylene chloride varied from two to nine times in samples taken on 27 and 28 April 1991 at Sites 21 and 25.

Tables G-2, G-19, G-20, and G-23 show the results of duplicate samples for metals taken on 27-29 April 1991. Good agreement is shown for all metals analyzed except for silver on 29 April 1991 shown in Table G-2 (variation of greater than four times) and iron on 27 April 1991 shown in Table G20 (variation of greater than 2 times).

Results of other duplicate samples taken for the miscellaneous analyses listed in Appendix H generally showed good agreement for ammonia, phenols, cyanide, phosphorus, Total Petroleum Hydrocarbons, and oils and greases.

Analytical QA/QC. In addition to the field QA/QC program, both the analytical section of Armstrong Laboratory and the contract laboratory have in-house QA/QC programs that follow guidance established by the Environmental Protection Agency (EPA). Any questions concerning these QA/QC procedures should be addressed to the Occupational and Environmental Health Directorate's Analytical Services Division, Armstrong Laboratory, DSN 240-3626.

Toxicity Identification Evalution

A Toxicity Identification Evaluation (TIE) was performed in conjunction with this survey. A TIE is a site-specific study conducted in a stepwise process to characterize and identify the cause(s) of final effluent toxicity. The evaluation can use both characterization procedures and chemical-specific analyses and, consequently, the characterizations/identifications may range from generic classes of toxic agents (e.g., nonpolar organics) to specific chemical compounds. Because multiple samples are required to perform this evaluation, a major objective of the TIE is to determine if, and how, the cause of final effluent toxicity varies over time (1).

A generalized flowchart for performing a TIE is presented in Figure 3. This flowchart presents a conceptual overview of the TIE process. Phase I of the evaluation is the performance of toxicity characterization tests to determine the class or group of the compound or chemical causing effluent toxicity. In Phase II of a TIE, analyses are performed to identify the specific toxicant(s) in the final effluent. Phase III is the confirmation of the suspected toxicants identified in the first two phases. In cases where toxicity identification was not successful, confirmation of the physical/chemical characteristics determined by Phase I should still be conducted.

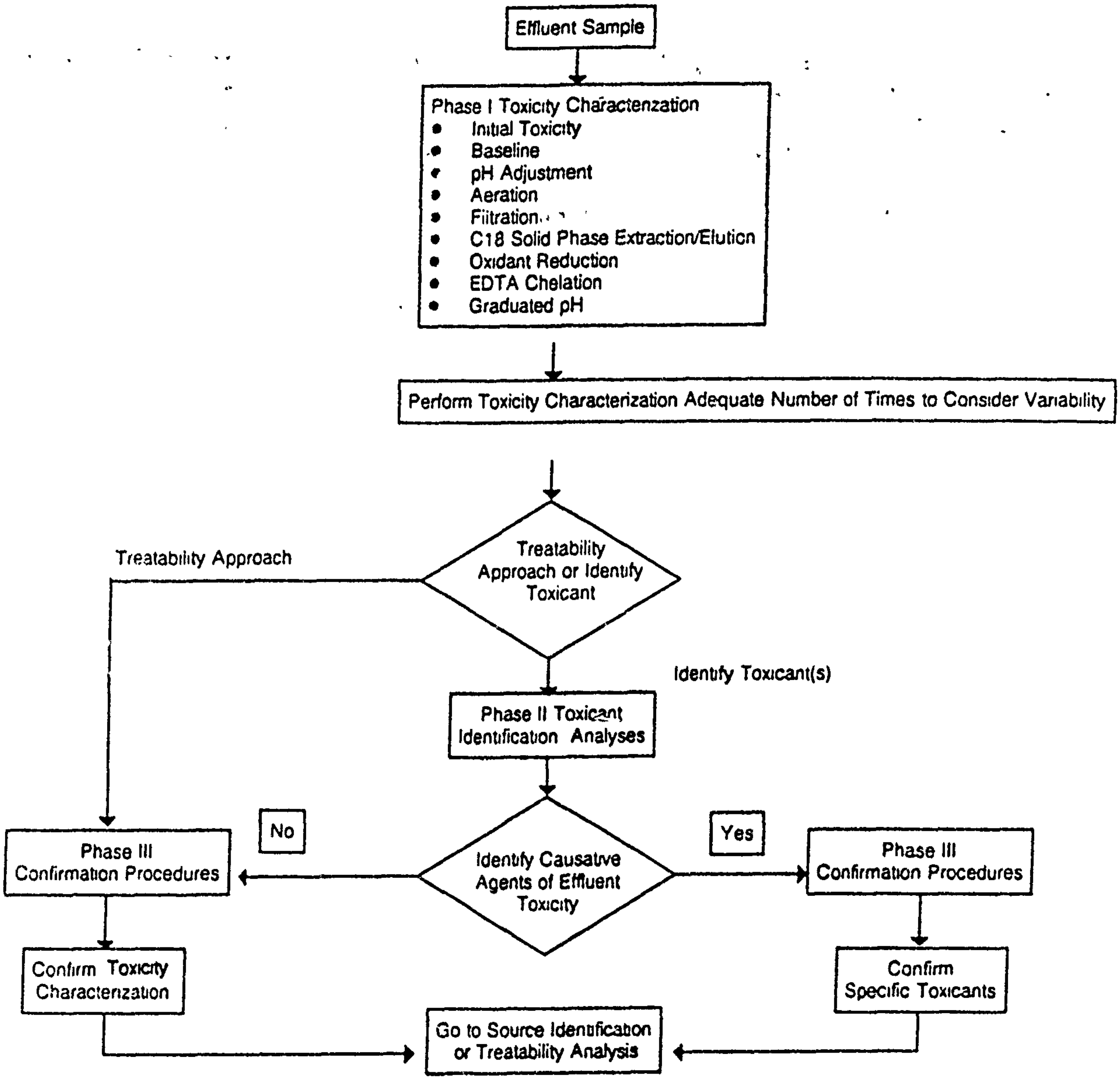


Figure 3. Toxicity Identification Evaluation (TIE) Flow Diagram (1).

Prior to conducting the TIE, preliminary data was gathered to identify the generators of hazardous/toxic wastes on base and the current administrative and engineering controls in place to prevent these wastes from entering the sanitary sewer system. Listings of the industrial shops monitored by BES and the hazardous materials used on base were obtained and used to develop the sampling strategy.

In February, 1991, personnel from the Hazardous Waste Function of Armstrong Laboratory conducted a Hazardous Waste Technical Assistance Survey (ref Armstrong Laboratory Consultative Letter 91-047EQ00179CHB, Hazardous Waste Technical Assistance Survey, Sheppard AFB, Wichita Falls TX, 19 March 1991). During this survey, hazardous materials usage and disposal practices were reviewed and recommendations were made to improve these practices. The recommendations that pertain to disposal of industrial wastes into the sanitary sewer system include: (1) analyzing the neutralized lead/acid electrolyte from the 80 TFW Dyncorp Battery Shop and the STTC Raytheon Battery and Electric Shop for lead content, (2) sampling the effluent from the 3750 ABG Golf Course Maintenance Shop and CES Entomology Shop to determine if rinsates from washing and rinsing of application equipment is a proper disposal method, and (3) sampling the STTC Trainer Fabrication Shop waterfall paint booth water for hazardous waste characteristics to determine if disposal of this waste in the sanitary sewer is an appropriate disposal method.

Quarterly monitoring of the sanitary sewer system (Outfall 101) is required by the NPDES Permit. Results of this sampling have shown that the base frequently exceeds its 50 parts per billion (ppb) limit for phenol. Monitoring of the WWTP effluent (Outfall 001) is performed and tracked by Civil Engineering. The Plant has been able to consistently meet its discharge limits for five-day biochemical oxygen demand (BOD5) and Total Suspended Solids (TSS). However, the base has had difficulty passing the biomonitoring requirements in the permit. A summary of the biomonitoring results for the last two years is shown in Table 2.

Bioenvironmental Engineering performs quarterly monitoring of the streams that exit Sheppard AFB. These sampling results are then compared to water quality criteria standards for the Wichita River (ref personal communication with Lt Boerma, STTC Hospital Bioenvironmental Engineering Services, 18 October 1991). These standards are shown in Table 3. The phenol data are compiled into an annual Water Pollution Inventory. Data for fiscal years 1989 and 1990 showed oils and greases were high due to surface runoff, sulfates were high due to runoff from the golf course, and nitrates were high in the WWTP effluent.

TABLE 2. SUMMARY OF SHEPPARD AFB BIOMONITORING RESULTS

Date	Fathead Minnow Result (Pass/Fail)	Ceriodaphnia dubia Result (Pass/Fail)
Sep 91	P	P
Aug 91	P	P
Jul 91	P	F
Jun 91	P	P
May 91	P	P
Apr 91	P	P
Mar 91	P	P
Feb 91	P	F
Jan 91	P	F*
Dec 90	P	P
Nov 90	F	P
Nov 90	P	P
Sep 90	F	P
Aug 90	P	F
Jul 90	P	F
Jun 90	P	F
Apr 90	P	P
Mar 90	P	F
Feb 90	P	F*
Jan 90	P	F*
Dec 89	P	F*
Nov 89	P	F
Oct 89	P	F

* Control mortality/reproduction problems

TABLE 3. WATER QUALITY CRITERIA STANDARDS FOR THE WICHITA RIVER

Pollutant	Standard (mg/l)
Nitrate	10
Chloride	250
Sulfate	250

Phase I

In Phase I of the TIE process, a battery of tests is used to determine the physical/chemical class or group of the toxic components in the effluent. Initially, an aliquot of the whole effluent sample is tested for

the baseline toxicity. If the sample is toxic, aliquots of the sample are run through a battery of Phase I tests which remove or render neutral (biologically unavailable) various classes of compounds; and then the corresponding toxicity of these "treated" aliquots is measured.

Toxicity characterization procedures, and chemical-specific analyses, produce snapshots of what is causing toxicity in a given sample. Only those toxic chemicals which are present when the samples were collected will be characterized or identified. Generally, the cause of an effluent's toxicity varies over time, requiring the analysis of a number of effluent samples to ensure the variability in effluent toxicity is taken into account.

During this survey, chemical-specific analyses were performed on common industrial wastewater pollutants as part of the wastewater characterization survey, and biomonitoring tests were performed on the WWTP influent and effluent using the Microtox system.

The Microtox bioassay system is based on the response of a photoluminescent marine bacterium (Photobacterium phosphoreum) population to various concentrations of a toxicant. If a sample is toxic to the bacteria, a dose-dependent reduction in the light produced should be observed. The Microtox bioassay system has several advantages over traditional bioassay of aquatic organisms. First, approximately one million bacteria are exposed to each concentration of a potential toxicant, plus a control. This methodology gives the system considerable resistance to individual variability among test organisms (often a significant problem with conventional bioassays). Second, Microtox results are consistently reproducible. A third advantage is that the bioassay only takes 90 minutes. One drawback of the test, though, is the low correlation between the results obtained from Microtox when compared to the results from bioassays using freshwater organisms such as Ceriodaphnia dubia or fathead minnows.

As previously mentioned, the objective of a toxicity characterization procedure is to narrow down the search for feasible treatment methods and/or methods of analysis to identify the causative agents of effluent toxicity. This objective is accomplished by dividing an effluent into a variety of fractions and then determining which of these fractions is toxic, or by isolating and inactivating a specific class of toxicants. The characterization procedure involves subjecting aliquots of the effluent to eight physical/chemical characterization tests. Following the tests, any change in effluent aliquot toxicity is determined by performing an acute toxicity test involving the Microtox system. Figures 4 and 5 show some of the steps involved in performing a bioassay using the Microtox system.

The first characterization test is a determination of baseline (whole) effluent toxicity that subjects the Microtox organisms to undiluted, untreated effluent water from the WWTP. If toxicity is noted in the sample, seven additional tests are performed. These tests are described below:

1. Degradation Test - to determine how much toxicity degrades over time.

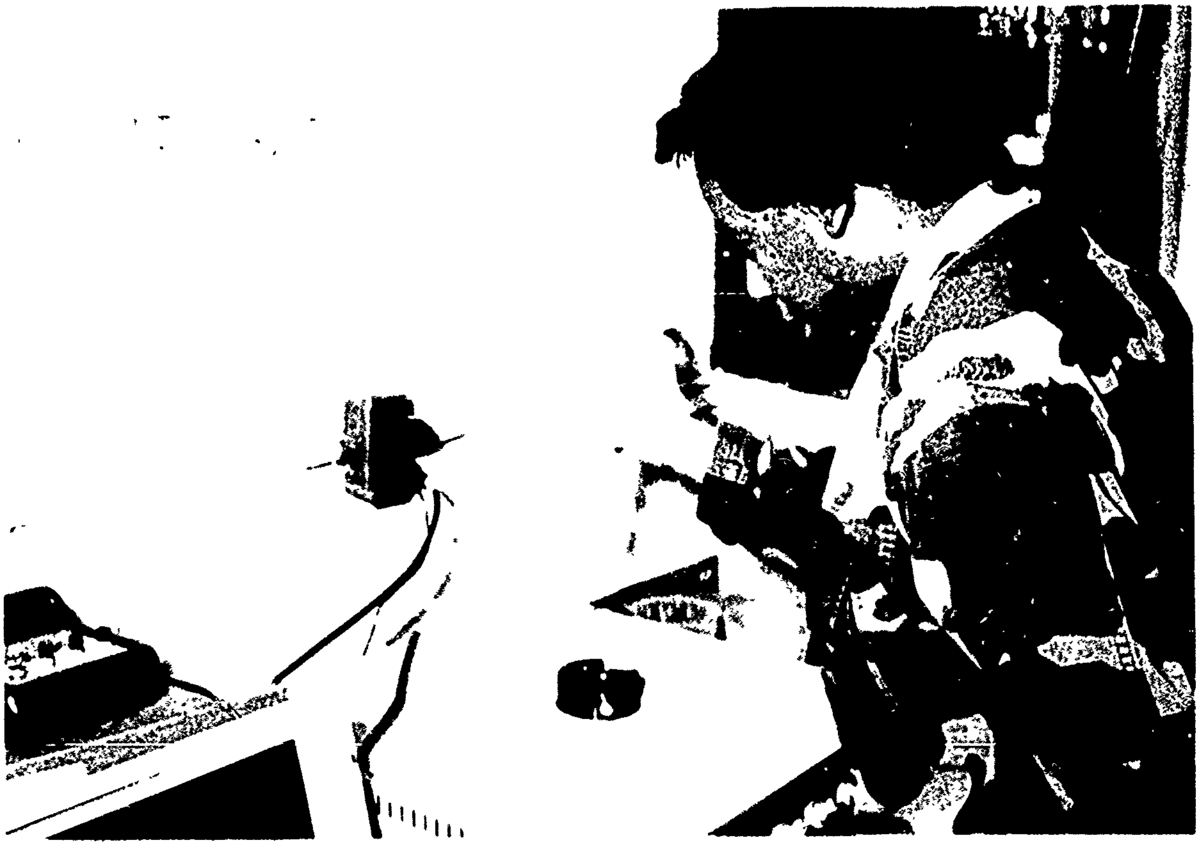


Figure 4. A1C Garrett adds reagents to wastewater samples in the Microtox analyzer.

Figure 5. Captain Holck analyzes Microtox data using a laptop computer.

2. pH Adjustment Test and Graduated pH Test - to determine the effect of pH manipulation on effluent toxicants and the effect on causative agent toxicit .

3. Filtration Test - to determine toxicity associated with filterable material or toxicants that can be made insoluble through pH change.

4. Aeration/pH Adjustment Test - to determine toxicity attributable to oxidizable or volatile compounds or those compounds that can be made volatile or oxidizable through pH change.

5. Solid Phase Extraction/pH Adjustment Test - to determine toxicity attributable to nonpolar organic and metal chelate compounds or those compounds that can be made nonpolar through pH change (pH adjustments help define the acidic, basic, and neutral character of these nonpolar toxicants).

6. Oxidant Reduction Test - to determine how much toxicity is attributable to oxidants or certain electrophiles.

7. EDTA Chelation Test - to determine how much toxicity is attributable to certain cationic toxicants such as heavy metals.

Phase II

The identification of specific toxicants was performed by comparing the results of the chemical analysis of WWTP effluent to the results from the characterization procedure.

Phase III

Regardless of whether the identification of toxic causative agents progressed to single chemicals or stopped at classes of chemicals, it is desirable to confirm these findings, preferably by eliminating the toxicity by removing the suspected toxicant(s) through source reduction/elimination. Another approach is to evaluate options for treating the final effluent, and then evaluate upstream treatment options or process modifications. The base is considering shutting down the WWTP and pumping its waste to Wichita Falls for treatment. Therefore, it is more prudent to identify the source of the final effluent toxicity than it is to recommend major treatment plant modifications.

Rapid Bioassessment of Unnamed Tributary to Plum Creek

We performed a rapid bioassessment (RB) of the unnamed tributary to Plum Creek following a protocol developed by Plafkin, et al. (2). The USEPA will be requiring states to assess water quality of receiving streams using this and other, similar techniques. The RB techniques being developed involve the calculation of various population ecology statistics for a stream and comparing them to an ideal. Although the theory is laudable, in practice a problem arises. Rapid bioassessments work best in well oxygenated, fast

flowing streams. Unfortunately, these conditions are difficult to find in North Texas, even in streams untouched by man. Thus, the results obtained for the golf course stream were mixed.

Evaluation of Wastewater Treatment Plant Performance

Information collected during the survey concerning the operation and performance of the WWTP was used in a computer program developed by the EPA called POTW Expert. POTW Expert is a personal computer-based software program modeled after EPA's handbook, Retrofitting POTWs, formerly, Handbook for Improving POTW Performance Using the Composite Correction Program Approach. POTW Expert assists publicly owned treatment works (POTW) owners and operators, state and local regulators, and consulting engineers to identify probable factors that might hinder an existing facility's ability to achieve optimum performance and/or capacity.

Operational data concerning the Sheppard AFB POTW was obtained from Sgt Michael Stanley. After data are input into the computer program, POTW Expert produces three reports that lead to the final identification of Potential Performance Limiting Factors. These reports include the Evaluation of Major Unit Processes, the Observation Report, and the Potential Performance Limiting Factors Report.

Evaluation of Major Unit Processes

An evaluation of the POTW's major unit processes is conducted to determine the performance potential of existing facilities at current loadings. The three unit processes whose capabilities most frequently affect biological wastewater treatment plant performance are the aerator (in this case the trickling filters), the secondary clarifier, and the sludge handling system.

A point system is used to quantify the evaluation of these three basic unit processes. Key loading and process parameters are calculated and the results for each parameter are assigned points by comparison with standard tables. Subsequently, each of the three major unit processes receives a total score by adding together the value of the points assigned the loading and process parameters. The totals are then compared with standards to assess whether a Type 1 (adequate), 2 (marginal), or 3 (inadequate) capability is indicated for that unit process. The overall plant type is determined by the "weakest link" among the three major process areas.

Observation Report

This report summarizes current observations and highlights potential performance factors. POTW Expert conducts a data integrity check after computing specific information on plant characteristics and loadings for the major unit processes. The data integrity check validates plant loading data with typical per capita contribution for domestic wastewater and compares other plant characteristics with the projected values for a plant of similar characteristics.

Performance Potential Limiting Factors Report

Whereas the evaluation of major unit processes in a plant is used to broadly categorize performance potential by assessing only physical facilities, the identification of performance-limiting factors focuses on one facility, and the factors unique to that facility.

After identifying these factors, each is prioritized according to its adverse effect on achieving desired plant performance. The purposes of this prioritization are to establish the sequence and/or emphasis of follow-up activities necessary to achieve compliance. If the highest ranking factors are related to physical limitations in unit process capacity, initial corrective actions are directed toward defining plant modifications and obtaining administrative funding for implementing them. If the highest ranking factors are process control oriented, the initial emphasis of follow-up activities would be directed toward plant-specific operator training.

Storm Water Sampling

On 16 November 1990, EPA published new storm water regulations to comply with the Clean Water Act (CWA), Section 402p (3). The CWA requires EPA to establish regulations under the NPDES Permit program. The rules regulate certain industrial and municipal discharges of storm water. This regulation requires industrial storm water dischargers to apply for a permit either individually or as part of a group of similar industries by May 1992. Organizations that apply for a group application must show that activities at their geographically separated sites are similar both in activities performed and in chemical storage and usage. If the EPA agrees that the group is similar, then only a representative sampling (10-20%) of the sites must perform quantitative sampling by May 1992. Based on the results of the initial sampling, chemical-specific permits will be issued by September, 1992, for all the sites under the group application. The U.S. Air Force (USAF) has applied as a group; Sheppard AFB is not on the list of bases that have to perform the initial quantitative sampling.

Storm water was sampled at Sheppard AFB at the request of the Environmental Coordinator to provide background information on the quality of the storm water discharged by the base. Guidance from the storm water regulation was used in performing this sampling, though not all the requirements of the law were strictly followed. For instance, detailed information concerning the usage and storage of hazardous materials in each of the base's drainage zones was not collected and used in developing a sampling strategy. The base was not surveyed intensely to determine the number and location of all storm water discharges from the base. Instead, the discharge points normally monitored by the base as part of its current NPDES Permit were sampled.

The majority of the surface water runoff from Sheppard AFB exits the base from three main conveyances. Drainage from the runway and the industrial areas north of Taxiway G exits the base via Bear Creek (See

Figures 6, 7, and K-1). Drainage from the cantonment area of the base and the runway area south of Taxiway G exits the base and into Clark's Pond. Drainage from the housing area at the south end of the base and the northeast side of the golf course exits the base through the unnamed tributary feeding Plum Creek (See Figures 2 and K-2).

Sampling Strategy

The storm water regulation published in November, 1990, describes the mandatory analyses that must be performed by September, 1992. First, samples must be collected from the discharge resulting from a storm event that is greater than 0.1 inch and which occurs at least 72 hours from the previously measurable (greater than 0.1 inch) storm event. Where feasible, the variance in the duration of the event and the total rainfall of the event should not exceed 50% from the average or median rainfall event in that area. A flow-weighted composite shall be taken for either the entire discharge or for the first three hours of the discharge. The flow-weighted composite sample for a storm water discharge may be taken with a continuous sampler, or as a combination of a minimum of three sample aliquots taken in each hour of discharge for the entire discharge or for the first three hours of the discharge, with each aliquot being separated by a minimum period of fifteen minutes. However, a minimum of one grab sample may be taken for storm water discharges from holding ponds or other impoundments with a retention period greater than 24 hours. For storm water discharge samples taken from discharges associated with industrial activities, quantitative data must be reported for the grab sample taken during the first thirty minutes (or as soon thereafter as practicable) of the discharge (3).

For all storm water permit applicants taking flow-weighted composites, quantitative data must be reported for the following pollutants:

1. Any pollutant limited in an effluent guideline to which the facility is subject.

2. Any pollutant listed in the facility's NPDES Permit for its process wastewater. (This list would include iron, manganese, copper, zinc, phenols, and toluene.)

3. Oil and grease, pH, total suspended solids, chemical oxygen demand, five-day biochemical oxygen demand, total phosphorus, total Kjeldahl nitrogen, and nitrate plus nitrite nitrogen.

4. Other pollutants the applicant is expected to know is present, or who has reason to believe is present, based on an evaluation of the expected use, production, or storage of the pollutant, or on any previous analyses for the pollutant.

The sampling performed during this survey included the pollutants included in paragraphs 2 and 3 above, as well as volatile organics (EPA Methods 601 and 602) and heavy metals screens.

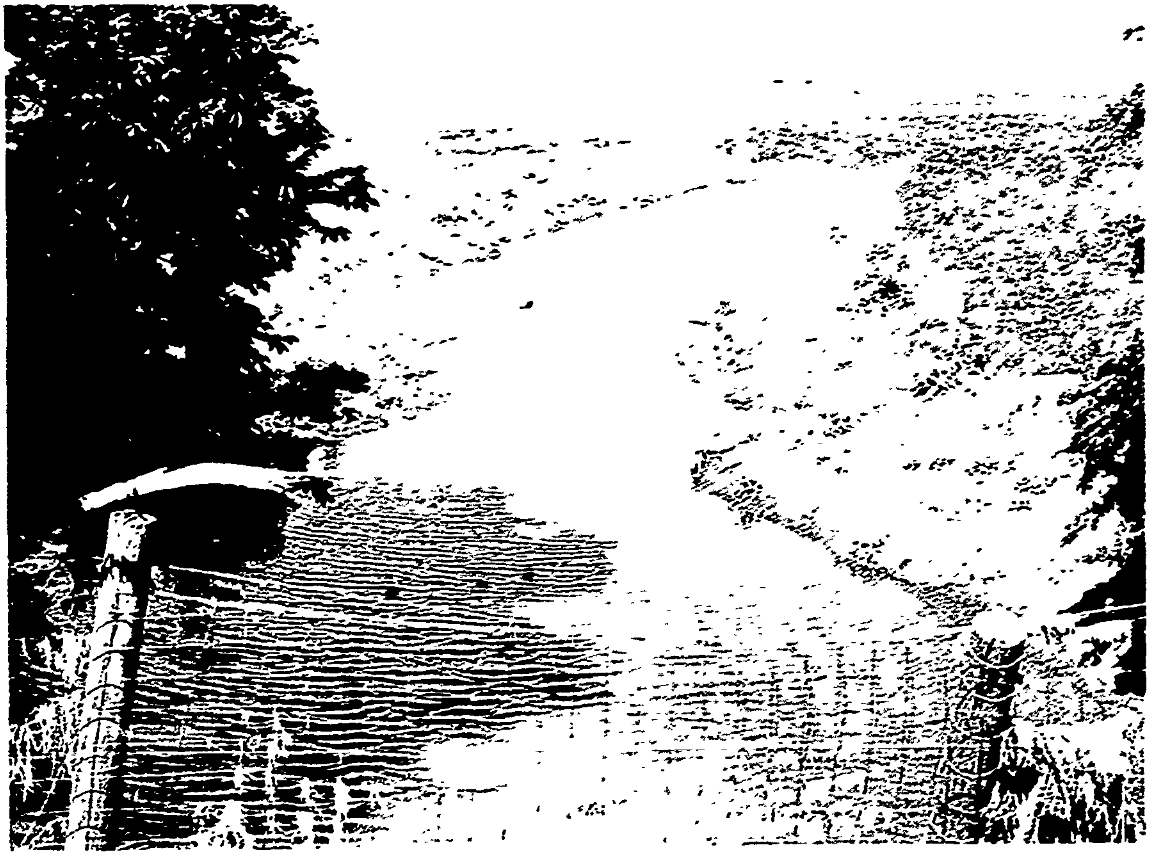


Figure 6. Bear Creek Exit (East View, with SAFB in background).

Figure 7. Bear Creek Exit (West View).

Odor Survey

A bulk air sample was collected at Site 9, (see Figure 8) along with samples collected on charcoal tubes. This site was selected because the strong onion-like odor was most pronounced here during the period of our survey. The bulk sample was analyzed using infrared analysis in an attempt to identify the chemical or class of chemicals causing the odor. The charcoal tube samples were collected to quantify the concentration of the chemical. The tubes were desorbed and analyzed using gas chromotography.

RESULTS

Wastewater Characterization Survey

Flow Measurements

Flow is continuously monitored at the influent to the WWTP. The measurements for the sampling period were obtained from the plant and the daily flow of wastewater was estimated by adding the flows recorded each hour over an eight-day period. The results are shown in Table 4. Each day's flow represents the period from 0001 to 2400.

TABLE 4. FLOW DATA FOR SHEPPARD AFB WASTEWATER TREATMENT PLANT

Date	Flow (millions of gallons)
23 Apr	0.92
24 Apr	1.12
25 Apr	0.97
26 Apr	0.95
27 Apr	0.78
28 Apr	0.84
29 Apr	0.86
30 Apr	0.86
01 May	0.97

Volatile Organic Chemicals (VOCs)

Volatile organic chemical results are shown in Appendix F. Concentrations of organic chemicals above the analytical detection limit are shown in shaded boxes.

Carbon tetrachloride was detected at one site (Site 16, Raytheon Battery Shop) at a concentration of 1.0 μg/l. Since this lone result is near the detection limit, it is most likely an artifact of the analytical procedure and not an indication of improper disposal by base personnel.

Chloroform was detected at 13 sites in concentrations ranging from 0.67-18 μg/l. Chlorodibromomethane was found on one day at Site 21 at a concentration of 0.96 μg/l. These compounds are routinely found in

Figure 8. Site 9.

wastewater analyses and are usually the products of reactions of organic compounds with residual disinfectants.

Dichlorobenzenes (including 1,2-, 1,3-, and 1,4-dichlorobenzene) were found at four sites (#2, 11, 15, and 19); concentrations ranged from 0.74 to 23 µg/l. Dichlorobenzenes are used in solvent applications, such as cleaning and polishing formulations, motor oil additive formulations, paints, rust preventives, and as a carrier solvent for wood preservatives and repellents (4).

Dichloroethanes (1,1- and 1,2-) were found at Sites 2 and 25 in concentrations ranging from 1.5 µg/l to 4.3 µg/l. Trans-1,2-dichloroethene was detected at 6 sites (#2, 4, 5, 17, 19, and 20). These compounds are used as cleaning solvents and degreasers, varnish and finish removers, and wetting and penetrating agents (5).

Methylene chloride, a common solvent used in paints, was found in detectable concentrations at 13 sites. Concentrations ranged from a high of 480 µg/l to a low of 4.4 µg/l, both at Site 25. Methylene chloride was also found in the wastewater treatment plant influent and effluent consistently during the first five days of sampling.

Other commonly found industrial chemicals were also detected in sporadic instances during this survey. These included trichloroethane at Site 2, trichloroethylene (TCE) at Sites 2 and 9 in concentrations of 0.64-5.2 µg/l, tetrachloroethane at Sites 3, 4, and 12 in concentrations of 11 to 290 µg/l, and 260 µg/l of tetrachloroethylene (PCE) at Site 4. These intermittent solvent levels are indications that either small amounts of these chemicals are poured down drains or are entering the sewage system via rinse water.

Toluene was detected at 17 sites in concentrations ranging from just above the detectable limit of 0.3 µg/l to 23 µg/l. These concentrations were well below the 50 µg/l permit standard. Benzene was detected at only three sites (#2, 3, and 4) in concentrations ranging from 0.61 to 6.0 µg/l. Ethyl benzene was detected at three sites (#3, 4, and 9) at relatively low concentrations of between 0.4-14 µg/l. Xylenes (ortho, meta, and para substituted) were detected at seven sites (2, 4, 5, 17, 19, 20, and 22) in concentrations ranging from 0.48-26.6 µg/l. These results indicate that the use of aromatic organic chemicals is being well controlled in the shops.

Metals Results

Results of wastewater analysis for metals is shown in Appendix G. These results follow.

The NPDES Permit establishes daily average concentration limits in the sanitary sewer system for copper, manganese, and zinc. During this survey, the 500 µg/l standard for copper was exceeded twice at Site 9. In addition, the 1.0 mg/l limit for manganese was exceeded once at Site 9. The 1.0 mg/l limit for zinc was exceeded twice at Site 9 and once at Site 6. As Table G-9 shows, the concentrations of metals at the Medical Lab School site are high and warrant further investigation. The School, or other activity in that

area, is causing the release of high concentrations of metals into the sewer system.

Other metals results of significance include those for lead, chromium, mercury, and silver. Lead levels of 50 µg/l or higher were found at eight sites (#2, 3, 4, 5, 6, 9, 15, and 20). Chromium concentrations of 50 µg/l or higher were found at six sites (#2, 4, 5, 9, 15, and 25). Mercury concentrations of 50 µg/l or higher were found at two sites (#6 and 9). Silver levels of 50 µg/l or higher were found at five sites (#2, 4, 5, 9, and 25). Again, these metals were all found in elevated levels at Site 9, indicating that significant amounts of metals are being discharged in the area of the Medical Lab School, or metal-bearing sediments have been deposited in traps in that area and are leaching into the sewer system.

Other Results

Several other analyses were conducted to characterize the quality of the wastewater. The results of these analyses are contained in Appendix H and are discussed below.

Samples were collected and analyzed for phenols to determine if a source of these emissions could be found. Table H-1 shows these results. The NPDES Permit establishes a discharge limit of 50 µg/l at any point in the sanitary sewer system. The levels depicted in shaded blocks in Table H-1 are those that were above the 50 µg/l limit. As can be seen from the table, many of the samples were over the limit, and in particular, Site 4, Battery, Electroplating, Metal Fabrication and Comm/Nav Shops, had some of the highest results (greater than 1000 µg/l). Despite the fact that the base is frequently exceeding the 50 ppb standard within the sanitary sewer system, Table 5 shows that the WWTP is adequately removing the phenol before it is discharged into Plum Creek.

TABLE 5. INFLUENT AND EFFLUENT PHENOL CONCENTRATIONS

Date	Influent Conc. (mg/l)	Effluent Conc. (mg/l)	Percent Removal (%)
26 Apr	55	18	67
27 Apr	47	10	79
28 Apr	60	10	83
29 Apr	35	10	71
30 Apr	32	<10	69
01 May	27	10	63

Ammonia and cyanide results are shown in Tables H-2 and H-3, respectively. These analytes were sampled to determine if photographic processes were discharging significant amounts of these pollutants. The results for ammonia show that the concentrations found during the second week of sampling (29 April 1991 - 1 May 1991) at Sites 20, 21, 22 and 25 were much higher than during the first week, indicating that photographic processing may have occurred more frequently during the second week. The high ammonia concentrations found at Site 2 indicate NDI may be a source of these

emissions. Cyanide results do not show any significant concentrations for raw sewage, especially when compared to the EPA's Pretreatment Standard of 1.2 mg/l.

Phosphorus concentrations in the wastewater treatment plant influent and effluent are listed in Table H-4. These values are typical for domestic sewage. Surfactant concentrations are shown in Table H-5. Concentrations of surfactants at the headworks of the WWTP (Site #20) were higher during the first week than during the second. However, comparing these values with the WWTP effluent values, it is clear that the treatment plant is adequately removing surfactants.

Total petroleum hydrocarbon (TPH) and oils and greases (O&G) analyses were performed to estimate the amount of hydrocarbons in the wastewater that originated from petroleum sources. The TPH results listed in table H-6 show that Sites 2, 3, 5, 15, and 20 had the highest concentrations during our survey. The O&G analyses (Table H-7) indicate high concentrations at Sites 5, 6, 20, 22, and 26. The O&G level of 1360 mg/l found at the WWTP influent on 29 Apr is unusually large, but the concentrations measured at the WWTP effluent (Site 22) indicate that the treatment plant is adequately controlling oils and greases levels.

Pesticide analyses were performed at Site 7, Pest Management School, and Site 11, Base Pest Management Shop. A listing of the pesticides used by these organizations was obtained from Bioenvironmental Engineering and aided in the development of the sampling plan for these sites. The results of this sampling are shown in Table H-8. Detectable levels of Simazine, Dursban, Dalapon, and Dicamba were found at Site 7. Diazinon, Malathion, Dursban, Pyrethrin, 2,4-D, and Dicamba were detected in samples taken at Site 11.

Sampling for pentachlorophenol (PCP) was also performed at Site 10, Corrosion Control. The analytical results reported for samples taken from 29 April 1991 through 1 May 1991 showed no detectable levels (less than 1 μg/l) of this contaminant in the sanitary sewer system.

A sample was also taken on 30 April 1991 at Site 21, WWTP Effluent and analyzed for Total Toxic Organics (TTOs). A TTO, as defined by the EPA (6), is the summation of all quantifiable values greater than 0.01 mg/l for 78 organic chemicals. None of the analytical results reported for this sample exceeded 0.01 mg/l; therefore, the TTO result is reported as None Detected. For your information, concentrations for some of the contaminants were reported which were less than the 0.01 mg/l criteria, including: bis(2-ethylhexyl)phthalate (4.5 μg/l), bromodichloromethane (4.7 μg/l), chloroform (5.6 μg/l), and chlorodibromomethane (0.96 μg/l).

Toxicity Identification Evaluation

Biomonitoring Results

A total of 17 Microtox assays were performed on selected composite samples. A complete list of sampling dates, locations, sample numbers, EC50s and slopes is given in Table I-1. The EC50 refers to the effective

concentration of sample water that produces a 50% loss of photoluminescence. Slope refers to the slope of the log dose-response curve; it indicates the variability in organism response to exposure to the sample water. Small slopes indicate heterogeneity of response (population dies off slowly as the concentration of sample water increases); large slopes indicate homogeneity of response (population dies off quickly at a specific concentration). Also included in Appendix I are the outputs of each of the Microtox bioassay tests.

Results of the biomonitoring are listed below:

1. Wastewater treatment plant effluent was consistently nontoxic to the Microtox organisms.

2. Wastewater treatment plant influent was consistently toxic to the Microtox organisms. The most toxic sample was collected on 26-27 April 1991; the least toxic sample was collected on 24-25 April 1991. A rain event which occurred during 23-25 April 1991, and increased the flow observed, may have diluted the concentration of toxicants present.

3. The Wichita Falls Airport effluent did not seem to increase the toxicity of the base's WWTP influent.

4. The toxicity of the wastewater collected at the Flying Training Wing Maintenance Area (Site 5) was not significantly different from treatment plant influent toxicity.

A Phase I Toxicity Identification Evaluation (TIE), as described by Mount and Anderson-Carnahan (7) was conducted using wastewater treatment plant influent collected on 25-26 April 1991. The results of each Microtox assay performed are shown in Appendix I. The following observations were made:

1. EDTA chelation, acidic pH adjustment without filtering, and aeration did not significantly alter the toxicity of the treatment plant influent.

2. Basic pH adjustment, acidic pH adjustment with filtering and oxidant reduction with 1.0M sodium thiosulfate significantly lowered the toxicity of the treatment plant influent. Toxicity subsequent to basic pH adjustment with filtering was not significantly different from that of basic pH adjustment alone.

3. Analytical results for this sample indicated that the following pollutants were present, as listed in Table 6.

TABLE 6. POLLUTANTS FOUND IN WWTP INFLUENT, 25-26 APRIL 1991

Pollutant	Concentration
Copper	30 μg/l
Iron	390 μg/l
Magnesium	9.9 mg/l
Silver	10 μg/l
Zinc	50 μg/l
Chloroform	14 μg/l
Methylene Chloride	18 μg/l
Toluene	11 μg/l
Ammonia	0.24 mg/l
Cyanide	0.012 mg/l
Surfactant	2.6 mg/l
TPH	3.7 mg/l
Oils & Grease	131.4 mg/l
Phosphorus	5.5 mg/l

4. With so many components contributing to the influent stream, it is difficult to single out any one that is contributing the bulk of the toxic reaction. The TIE procedures help clarify the situation. The lack of significant change in toxicity after aeration or EDTA chelation indicates that neither the volatile organic hydrocarbons (chloroform, methylene chloride and toluene) nor the cationic metals (copper, iron, magnesium, silver and zinc) are contributing to the toxicity of the influent.

5. The decrease in toxicity subsequent to treatment with 1.0M sodium thiosulfate, in conjunction with the analytical result suggests that an electrophilic organic compound may be the cause of the toxicity observed. Surfactants, total petroleum hydrocarbons (TPH), and oils and greases could contain several electrophilic compounds. Ammonia is also an electrophile, but its toxicity is highly dependent on dissolved oxygen concentration, pH, and temperature. Cyanide and phosphorus are two additional components of the influent that could be contributing to the toxicity observed. The decrease in toxicity observed subsequent to basic pH adjustment is also difficult to analyze without knowing the specific hydrocarbons present.

Rapid Bioassessment of Unnamed Tributary to Plum Creek

The benthic community was dominated by nematodes and chironomids, both tolerant species. Gastropods and hirudins were also common. No specimens from the orders Ephemeroptera, Plecoptera or Trichoptera were present, which indicates that, under EPA criteria, the stream is impaired. However, in our professional judgment the condition is typical of a man-made, warm-water limited flow stream.

Evaluation of Wastewater Treatment Plant Performance

The output created by the POTW Expert program is contained in Appendix J. Each of the reports generated is discussed below.

Evaluation of Major Unit Processes

From the evaluation of Sheppard AFB's POTW, the overall rating of the unit processes is Type 3. A Type 3 plant is one in which the existing major unit processes are inadequate. Although other limiting factors may exist, such as the operators' process control capability or the administration's unfamiliarity with plant needs, performance cannot be expected to improve significantly until physical limitations of major unit processes are eliminated.

Observation Report

The BOD5 loading is within acceptable ranges based on the population served. The sludge handling process appears to be inadequate. The POTW Expert program has determined that enough sludge can be hauled to ultimate disposal without drying to allow the drying beds to operate at a Type 2 level, thus making the overall rating of the plant a Type 2.

Performance Limiting Factors Report

The Type "A" factors (those that could potentially have a major impact on a long-term, repetitive basis) include:

1. Recirculation from the final clarifier to the influent of the trickling filter may cause excessive hydraulic loading to the final clarifier.

2. The reported TSS loading is at least 30% greater than the plant's organic loading, which may be due to a break in the sewer line allowing excess grit to enter the system.

3. The trickling filter was rated a Type 2 unit due to anaerobic sidestreams being returned to the filter.

Storm Water Sampling

As stated previously, the majority of the surface water runoff from Sheppard AFB exits the base boundaries at three locations. Maps showing the drainage patterns of the base and the storm water sampling locations are contained in Appendix K.

On 2 May 1991, a rainfall event occurred at Sheppard AFB which resulted in a measured rainfall of 1.86 inches. The previous rain had occurred on 23 April 1991. According to Sgt Buchanan of the Sheppard AFB Weather Squadron, the average rainfall at Sheppard AFB in May is 4.5

inches. Rainfall has been recorded there an average of 9 days for the month, which results in an average rain event during May of 0.5 inches. Therefore, the storm event we sampled did not fall within 50% of the mean rainfall event; however, this does not invalidate our sampling since the regulation only states the 50% criteria should be met "where feasible."

Storm water flow velocities were measured every 15 minutes during the storm event using McBirney stream current meters. The height of the water was also recorded to determine volumetric flow rates. These calculations are shown in Tables K-1 and K-2. The volumetric flow rates were used to determine the proper sample compositing ratios. As can be seen from the tables, volumetric flow rates measured each hour over the first three hours were approximately equal. Therefore, composites for Bear and Plum Creeks were made by combining three equal-volume aliquots from each of the three one-hour samples.

Grab samples were collected once each hour for three hours after the first flush grab sample was collected. After closer scrutiny of the storm water regulation, we found that three grab samples should have been taken in each of the three hours. For this reason, and the fact that detailed inventories of current and past chemical usage and storage procedures were not included in the sampling, the sampling we performed did not meet the requirements of the storm water regulation. However, the data obtained does give some insight into the impact that Sheppard AFB's runoff has on local receiving bodies of water.

The results of the storm water sampling are shown in Tables K-3 through K-5. At this time, these results can only be compared to water quality criteria standards for the Wichita River and storm water sampling results published in the literature, since the storm water regulation has not promulgated any standards.

As stated above, the BES has used historic criteria for the Wichita River in their Annual Water Pollution Inventory (See Table 3). The only criteria reported that were required to be sampled by the storm water rule were nitrates. The nitrate levels found at all three sites were well below the criterion level of 10 mg/l.

The concentrations of pollutants measured in the storm water were also compared to values cited by Novotny and Chesters (8). These values are listed in Tables K-3 through K-5. As these tables show, the concentrations found in the storm water are on the low end of those values cited in the literature.

Odor Survey

The results of the infrared analysis of the bulk air sample taken at Site 9 did not identify specific compounds that could be causing the odor. The results of the analysis of the charcoal tubes and silica gel tubes showed approximately 150 ppm of methane, which can be expected in a manhole air sample, but showed no conclusive agents which could be causing the odor.

It was noted that a lot of solids had built up in the manhole at Site 9 due to low flow. These solids are probably releasing some malodorous gases as a result of biological decomposition. Because the base has diverted a portion of its sewage to the municipal WWTP north of the base, the flow in the base's sewer system has been significantly reduced.

CONCLUSIONS

Wastewater Characterization Survey

During the survey, methylene chloride, trichloroethane, TCE, PCE, toluene, xylenes, ethyl benzene and benzene were found in low concentrations at several sites, indicating that small amounts of industrial solvents are entering the sewer system. The NPDES permit limit for toluene of 50 µg/l was not exceeded during the survey.

Copper, manganese, and zinc concentrations measured during this survey exceeded the NPDES permit limits on 5 occasions. Highest concentrations of these metals were found at the discharge from the Medical Lab School.

Phenol concentrations exceeded the 50 µg/l permit standard a total of 39 times at 13 sites. Sites 2, 3, 4, 5, and 15 had the highest recorded readings. The WWTP adequately removed phenol to below 10 µg/l every day of sampling except on 26 April 1991.

Elevated concentrations of cyanide found at Site 2 indicate that photoprocessing at NDI may be the source of the cyanide.

Detectable levels of pesticides at Sites 7 and 11 indicate that shop practices at the Pest Management School and Shop are releasing pesticides into the sewer system.

No detectable levels of PCP were found in the sanitary system. A TTO performed on the WWTP effluent was negative for 78 toxic organic chemicals.

Toxicity Identification Evaluation

The effluent from the WWTP was consistently nontoxic to the Microtox organism during the survey. Fractionation of the WWTP influent revealed that an electrophilic organic compound may be the cause of toxicity in the WWTP effluent. Compounds that could be causing the toxicity include petroleum hydrocarbons, oils and greases, and surfactants. Since August 1991, the base has been passing its biomonitoring for both *Ceriodaphnia dubia* and fathead minnows.

Evaluation of Wastewater Treatment Plant Performance

Although Sheppard AFB's wastewater treatment plant has been meeting their BOD5 and TSS standards, the POTW Expert evaluation suggests that there are some operational applications that can be improved.

Recirculation from the final clarifier to the influent of the trickling filter may cause excessive hydraulic loading to the final clarifier. The TSS reported is high and may indicate that an excessive amount of solids are getting into the sewer system, possibly from a break in the sewer line. Evidence of a significant intrusion problem was noted during this survey. A significant increase in WWTP influent flow was noted after a rain event.

Storm Water Sampling

Though storm water sampling wasn't performed entirely by conditions established in the EPA regulation, background data are now available on the quality of the storm water runoff exiting Sheppard AFB. When results of this sampling are compared to water quality criteria for the Wichita River, the results show the runoff meets these standards. Also, when the results are compared to literature values, they are found to be at the low end of the reported values.

Odor Survey

The odor survey was inconclusive, but it was evident from observations of low sanitary sewer flow that solids, which are building up and allowing biological decomposition to occur, may cause the onion-like odor.

RECOMMENDATIONS

Wastewater Characterization Survey

Followup sampling for metals should be conducted at the Medical Lab School to determine if that site is discharging high levels of metals. Civil Engineering should also determine if there are any sediment traps in the area and clean them out, if necessary. Phenol is still being emitted by industrial users near Sites 2, 3, 4, and 5 on the north side of the base. Chemical listings for the shops in this area should be reviewed to determine the source of the phenol.

Toxicity Identification Evaluation

If, in the future, the base fails its bioassay test, water samples should be collected and analyzed for oils and greases, surfactants and total petroleum hydrocarbons in conjunction with bioassay sample collection.

Evaluation of Wastewater Treatment Plant Performance

Any future modifications to the WWTP to enhance its performance should consider the recommendations made in the POTW Expert evaluation.

Odor Survey

A concerted sewer flushing program should be initiated when complaints arise concerning the onion-like odor. Flushing the solids out of the sewer lines should help alleviate the odor.

REFERENCES

1. Fava, J.A., et al. Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations (TREs), pages 6-1 to 6-6. Cincinnati, OH: U.S. Environmental Protection Agency, 1989.

2. Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. Washington, DC: U.S. Environmental Protection Agency, 1989

3. Federal Register, Vol. 55, No. 222, Friday, November 16, 1990, pages 48062-48091.

4. Armstrong Aerospace Medical Research Laboratory. The Installation Restoration Program Toxicology Guide, Vol. 2, page 25-11. Wright Patterson AFB, OH: USAF AAMRL 1989.

5. Armstrong Aerospace Medical Research Laboratory. The Installation Restoration Program Toxicology Guide, Vol. 1, pages 8-10 and 9-12. Wright Patterson AFB, OH: USAF AAMRL 1989.

6. Code of Federal Regulations, Title 40, Part 413, Section 2(i), July 1, 1990.

7. Mount, D.I., and L. Anderson-Carnahan. Methods for Aquatic Toxicity Evaluations: Phase I Toxicity Characterization Procedures. Duluth, MN: U.S. Environmental Protection Agency, 1988.

8. Novotny, V. and C. Chesters. Handbook of Nonpoint Pollution, Sources and Management. New York, NY: Van Nostrand Reinhold Company, 1981.

APPENDIX A

REQUEST LETTER

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR TRAINING COMMAND (ATC)
RANDOLPH AIR FORCE BASE TX 78150-5001

4 JAN 1988

REPLY TO ATTN OF: SGPB

SUBJECT: On-Site Waste Stream Characterization/Hazardous Waste Studies at Air Training Command Bases

TO: USAFOEHL/CC

1. During the last six months three ATC bases in Texas received notices of non-compliance from the US Environmental Protection Agency. At our request the USAFOEHL Environmental Quality Branch (ECQ) performed waste stream characterization/hazardous waste studies at Reese and Sheppard AFBs to help in the responses to EPA. Laughlin AFB recently received a notice concerning operation of its waste water treatment plant (WWTP). The NPDES permit for the Laughlin WWTP expires 13 Jul 88. The EPA inspectors stated the application for renewal was due 13 Jan 88 and needed to be supported by data from a wastewater analysis. HQ ATC/SGPB perceives a need to have waste stream/hazardous waste studies performed at each of its bases to support various environmental requirements and requests USAFOEHL/ECQ to complete studies at the remaining ATC bases during the next twelve months.

2. Request waste stream characterization/hazardous waste studies be completed at ATC bases in the order listed in Attachment 1. The suggested completion dates are subject to your workload with the exception of Laughlin AFB. The data from the study for Laughlin AFB should be available by the end of the month shown to support the NPDES permit renewal application. The studies should collect sufficient data to characterize waste streams, including wastewater and WWTP influent and effluent; to determine compliance with EPA requirements; and to provide recommendations on waste handling, disposal, and minimization procedures. The attached listing does not include Reese, Sheppard, or Columbus AFBs since studies on these bases were previously requested.

3. The information listed below may already be available and you may wish to use it to avoid duplicating previous work.

a. Previous sampling conducted by Bioenvironmental Engineering Services (BES). Some bases have completed more sampling than others.

b. HQ ATC/DEEV contracted with the DoE HAZWRAP function to collect and analyze eight samples of process wastes from each ATC base. HAZWRAP will collect samples from Keesler, Lowry, and Randolph AFBs during FY88 and may collect samples from six additional bases in FY89 if funding is available. HQ ATC/DEEV will select the process sampling points. Please contact HQ ATC/DEEV, Mr. Carl Lahser or Capt David Parker, AV 487-3240, for more information and/or copies of the data.

UNITED STATES AIR FORCE

SEPTEMBER 18, 1947

c. Enid, Oklahoma, hired a contractor to study the waste streams at Vance AFB to determine pretreatment requirements for connection to the regional/municipal WWTP. This was mostly a paperwork review and sampling was probably not done. Vance AFB used the information to design an industrial waste treatment system. Please contact the Vance AFB Environmental Coordinator or HQ ATC/DEEV, Mr. Lahser, for the results of this study.

d. HQ ATC/DEEV contracted with the DoE Idaho National Engineering Laboratories (INEL) to write a waste minimization plan for Mather AFB. INEL collected information in Nov 87; they did not collect any samples. This information may be obtained through HQ ATC/DEEV, Mr. Lahser.

4. Please let us know if you can do this work and provide your schedule if the suggested completion dates are not reasonable. Contact the applicable BES offices (as shown in Atch 1) to arrange support and to request preliminary information. Please call Maj Crotchett or myself at 7-3764 if you have questions on this request.

Ronald L. Schiller

RONALD L. SCHILLER, Lt Col, USAF, BSC
Command Bioenvironmental Engineer
DCS/Medical Services & Training

1 Atch
ATC Base Priority List

cc: HQ ATC/DEEV
ATC MTFs/SGPB
HQ AFSC/SGPB

ATC PRIORITY LIST FOR
WASTE STREAM CHARACTERIZATION/HAZARDOUS WASTE STUDIES

Base	Suggested Completion Date	Base BES Point of Contact
Laughlin AFB	Mar 88	Lt O'Brien, AV 732-5259
Williams AFB	Apr 88	Lt Devenoge, AV 474-6516
Lackland AFB	May 88	Lt Vaughn, AV 473-3575
Randolph AFB	Jun 88	Capt Ballengee, AV 487-3256
Mather AFB	Jul 88	MSgt Sparks, AV 828-2284
Goodfellow AFB	Aug 88	TSgt Williams, AV 477-3123
Chanute AFB	Sep 88	Capt Davis, AV 862-4371
Lowry AFB	Oct 88	Lt Smith, AV 926-3176
Keesler AFB	Nov 88	Maj Jones, AV 868-6545
Vance AFB	Dec 88	TSgt Lamoreaux, AV 962-7241

APPENDIX B

SHEPPARD AFB NPDES PERMIT

Permit No. TX0025429

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C... 1251 et. seq; the "Act"),

United States Department of the Air Force
Sheppard Tech Training Center
3750 CES/DEEV
Sheppard Air Force Base
Wichita Falls, Texas 76311

is authorized to discharge from a facility located at Sheppard Air Force Base, Texas

to receiving waters named an unnamed tributary of Plum Creek; thence to Plum Creek; thence into the Wichita River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I (9 pages), II (6 pages), and III (6 pages) hereof.

This permit shall become effective on July 18, 1988

This permit and the authorization to discharge shall expire at midnight, July 17, 1993

Signed and issued this 17th day of June 1988

Myron O. Knudson, P.E.
Director
Water Management Division (6W)

Advertising Order Number 8T-3264-NNSA
U.S. Environmental Protection Agency - Region VI
Public Notice of Final Permit Decision

JUNE 18, 1988

This is to give notice that the U.S. Environmental Protection Agency, Region VI, has made a final permit decision and will issue the following ONE (1) Proposed Permit(s) under the National Pollutant Discharge Elimination System. The permit(s) will become effective 30 days from the date of this Public Notice. Any substantial changes from the Draft Permit are cited.

This issuance is based on a final staff review of the administrative record and comments received. A Response to Comments is available by writing to:

Ms. Ellen Caldwell
Permits Branch (6W-PS)
U.S. Environmental Protection Agency - Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 655-7190

Any person may request an Evidentiary Hearing on this final permit decision. However, the request must be submitted within 30 days from the date of this Notice. The request should be in accordance with the requirements of 40 CFR 124.74 (Federal Register Vol. 45, No. 98, Monday, May 19, 1980). The original public notice contains the stay provisions of a granted evidentiary hearing request.

Further information including the administrative record may be viewed at the above address between 8 a.m. and 4:30 p.m., Monday through Friday.

NPDES authorization to discharge to waters of the United States, Permit No. TX0025429

The applicant's mailing address is: United States Department of the Air Force
Sheppard Tech Training Center
3750 CES/DEEV, Stop 201
Sheppard Air Force Base
Wichita Falls, Texas 76311

The discharge from this Air Force Base is made into an unnamed tributary of Plum Creek; thence to Plum Creek; and thence to the Wichita River, a water of the United States classified for contact recreation and high quality aquatic habitat. The discharge is located on that water at Sheppard Air Force Base. Under the standard industrial classification (SIC) code 4952, the applicant's activities are the operation of a domestic wastewater treatment operation and pretreated industrial wastes.

There are substantial changes from the draft permit.

For internal control point 101, measurement frequency is reduced to 2/month.

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

OUTFALL 001

During the period beginning the date of issuance and lasting through the date of expiration, the permittee is authorized to discharge from Outfall 001 - treated domestic wastes and prior treated industrial wastes.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations			
	Mass(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow (MGD)	N/A	N/A	(*1)	(*1)
Biochemical Oxygen Demand (5-day)	567	N/A	20 mg/l	45 mg/l
Total Suspended Solids	567	N/A	20 mg/l	45 mg/l
Biomonitoring	N/A	N/A	N/A	N/A

	Instantaneous Maximum
Total Residual Chlorine (Dechlorinated Effluent)	No measurable (*4)

The effluent shall contain an instantaneous minimum chlorine residual of at least 1.0 mg/l, prior to final dechlorination and disposal, after a detention time of at least 20 minutes (based on peak flow).

Effluent Characteristic	Monitoring Requirements	
	Measurement Frequency	Sample Type
Flow (MGD)	1/day	Totalizing Meter
Biochemical Oxygen Demand (5-day)	2/week	Composite (*2)
Total Suspended Solids	2/week	Composite (*2)
Biomonitoring	(*3)	Composite (*2)
Total Residual Chlorine (Chlorinated Effluent)	1/day	Grab
Total Residual Chlorine (Dechlorinated Effluent)	1/day	Grab

OUTFALL 001

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored once per week, by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): following the final treatment unit except the sample requiring a minimum chlorine residual which shall be collected prior to dechlorination.

FOOTNOTES

(*1) Report.
(*2) See Part II, Paragraph A.
(*3) See Part II, Paragraph C.
(*4) No measurable will be defined as 0.1 mg/l or less.

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

OUTFALL 101

During the period beginning the date of issuance and lasting through March 30, 1989, the permittee is authorized to discharge from Outfall 101 - industrial wastes including painting, parts degreasing, electroplating and parts repair.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations			
	Mass(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow (MGD)	N/A	N/A	(*1)	(*1)
Iron, Total	N/A	N/A	N/A	(*1) mg/l
Manganese, Total	N/A	N/A	(*1) mg/l	(*1) mg/l
Copper, Total	N/A	N/A	(*1) mg/l	(*1) mg/l
Zinc, Total	N/A	N/A	(*1) mg/l	(*1) mg/l
Phenols	N/A	N/A	N/A	(*1) mg/l
Toluene	N/A	N/A	N/A	(*1) mg/l

Effluent Characteristic	Monitoring Requirements	
	Measurement Frequency	Sample Type
Flow (MGD)	2/month	Grab
Iron, Total	2/month	Composite (*2)(*3)
Manganese, Total	2/month	Composite (*2)(*3)
Copper, Total	2/month	Composite (*2)(*3)
Zinc, Total	2/month	Composite (*2)(*3)
Phenols	2/month	Composite (*2)(*3)
Toluene	2/month	Composite (*2)(*3)

OUTFALL 101

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Prior to discharge from the industrial waste sources to the domestic facility.

FOOTNOTES

(*1) Report.
(*2) See Part II, Paragraph A.
(*3) See Part II, Paragraph B.

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

OUTFALL 101

During the period beginning March 31, 1989 lasting through the date of expiration, the permittee is authorized to discharge from Outfall 101 - industrial wastes including painting, parts degreasing, electroplating and parts repair.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations			
	Mass(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow (MGD)	N/A	N/A	(*1)	(*1)
Iron, Total	N/A	N/A	N/A	(*1) mg/l
Manganese, Total	N/A	N/A	1.0 mg/l	2.0 mg/l
Copper, Total	N/A	N/A	0.5 mg/l	1.0 mg/l
Zinc, Total	N/A	N/A	1.0 mg/l	2.0 mg/l
Phenols	N/A	N/A	N/A	0.05 mg/l
Toluene	N/A	N/A	N/A	0.05 mg/l

Effluent Characteristic	Monitoring Requirements	
	Measurement Frequency	Sample Type
Flow (MGD)	2/month	Grab
Iron, Total	2/month	Composite (*2)(*3)
Manganese, Total	2/month	Composite (*2)(*3)
Copper, Total	2/month	Composite (*2)(*3)
Zinc, Total	2/month	Composite (*2)(*3)
Phenols	2/month	Composite (*2)(*3)
Toluene	2/month	Composite (*2)(*3)

OUTFALL 101

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Prior to discharge from the industrial waste sources to the domestic facility.

FOOTNOTES

(*1) Report.
(*2) See Part II, Paragraph A.
(*3) See Part II, Paragraph B.

SECTION B. SCHEDULE OF COMPLIANCE - Outfall 101

The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

Achieve Compliance March 31, 1989.

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

SECTION C. REPORTING OF MONITORING RESULTS

Monitoring results shall be reported in accordance with the provisions of Part III.D.4 of the permit. Monitoring results obtained during the previous month shall be summarized and reported on a Discharge Monitoring Report form postmarked no later than the 25th day of the month following the completed reporting period. The first report is due on July 25, 1988 .

PART II
OTHER CONDITIONS

A. The term "composite sample" means a sample made up of at least six portions combined in proportion to flow and collected no closer together than one hour, with all portions to be collected between the hours of 10 A.M. and 12 midnight for each day, or a sample continuously collected in proportion to flow.

B. "Composite sample" will be the flow weighted composite of all industrial waste sources.

C. CHRONIC BIOMONITORING REQUIREMENTS

a. The permittee shall test the effluent for toxicity in accordance with the provisions in this section. Such testing will determine if an appropriately dilute effluent sample affects the survival and reproduction or growth of the appropriate test organism. The permittee shall initiate the following series of tests within 60 days of the effective date of this permit to evaluate wastewater toxicity. All test organisms, procedures, and water quality assurance criterion used shall be in accordance with the latest revision of "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms", EPA/600/4-85/014. The following tests shall be used:

1) The permittee shall conduct a 7-day Ceriodaphnia dubia survival and reproduction test (Method 1002.0).

2) The permittee shall conduct a 7-day fathead minnow (Pimephales promelas) larval survival and growth test (Method 1000.0).

b. A minimum of 5 dilutions must be performed in addition to an appropriate control, using a minimum dilution factor of 0.3 (i.e., 100%, 30%, 10%, 3%, and 1%). In addition, two dilutions consisting of 92% and 85% of the final effluent must be contained in the test series.

c. The samples shall be collected at a point following the last treatment unit. Dilution water used in toxicity tests will be receiving stream water collected at a point upstream of the discharge. If receiving water is unsatisfactory as a result of pre-existing in-stream toxicity (greater than 20% mortality in the control), the permittee must substitute reconstituted dilution water, with hardness and alkalinity similar to that of the receiving stream water. The permittee shall also report to EPA the toxicity of the upstream receiving water.

d. Flow-weighted 24-hour composite samples representative of dry weather flows during normal operation will be collected from Outfall 001. These composites shall be combined in proportion to the average flow from each outfall for the day the sample was collected. The toxicity tests shall be performed on the flow-weighted composite of the outfall samples.

e. The toxicity tests specified in paragraphs (a) and (b) above shall be conducted once per month. The permittee shall prepare a full report of the results according to EPA/600/4-85/014, Section 10, Report Preparation. This full report need not be submitted unless requested and shall be retained following the provisions of Part III.C.3 of this permit.

f. The permittee shall submit the toxicity testing information contained in Table 1 of this permit to EPA along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting period following the toxicity test.

g. Should no toxicity occur within the first year of toxicity testing, in accordance with Paragraph (h) below, for both species tested at the effluent dilution equivalent to 1/2 of low flow (92%), the permittee shall certify this information in writing to EPA Region VI and these biomonitoring requirements shall expire.

h. For the purpose of this biomonitoring requirement, chronic toxicity is defined as a statistically significant difference at the 95% confidence level between the survival and growth or reproduction in the appropriate test organism exposed to the control and to an effluent dilution.

i. This permit shall be reopened to require further monitoring studies and/or effluent limits if biomonitoring data show actual or potential ambient toxicity to be the result of the permittee's discharge to the receiving stream. Modification or revocation of the permit is subject to the provisions of 40 CFR Part 122.62. Accelerated or intensified toxicity testing may be required in accordance with Section 308 of the Clean Water Act.

TABLE 1

BIOMONITORING REPORTING

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

Permittee: Sheppard Air Force Base
NPDES No.: TX0025429

Composite collected FROM: ____________ am/pm ______________ date
TO: ____________ am/pm ______________ date

Test initiated: ____________ am/pm ____________________ date

Dilution water used: ☐ Receiving water ☐ Reconstituted water

NUMBER OF YOUNG PRODUCED PER FEMALE @ 7 DAYS

Percent effluent (%)

REP	0%	1%	3%	10%	30%	100%	% at low flow %	% at 1/2 low flow %
A								
B								
C								
D								
E								
F								
G								
H								
I								
J								

TABLE 1 (Continued)

BIOMONITORING REPORTING

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

Permittee: Sheppard Air Force Base
NPDES No.: TX0025429

PERCENT SURVIVAL

Percent effluent (%)

Time of Reading	0%	1%	3%	10%	30%	100%	% at low flow %	% at 1/2 low flow %
24h								
48h								
7-day								

1. Fisher's Exact Test:

   Is the mean survival at 7 days significantly different (p=0.05) than the control survival for the % effluent corresponding to:

   a. LOW FLOW: ______ YES ______ NO
   b. 1/2 LOW FLOW: ______ YES ______ NO

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

   Is the mean number of young produced per female significantly different (p=0.05) than the control's number of young per female for the % effluent corresponding to:

   a. LOW FLOW: ______ YES ______ NO
   b. 1/2 LOW FLOW: ______ YES ______ NO

3. Enter percent effluent corresponding to each NOEL below and circle lowest number:

   a. NOEL survival = ________ % effluent
   b. NOEL reproduction = ________ % effluent

4. If you answered NO to 1.a. <u>and</u> 2.a., enter [N]; otherwise enter [Y]: ____

5. Enter response to item 4 on DMR Form, Parameter No. TCP3B.

6. If you answered NO to 1.b. <u>and</u> 2.b., enter [N]; otherwise enter [Y]: ____

7. Enter response to item 6 on DMR Form, Parameter No. TDP3B.

TABLE 1 (Continued)

BIOMONITORING REPORTING

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL TEST
(*Pimephales promelas*)

Permittee: Sheppard Air Force Base
NPDES No.: TX0025429

Composite collected FROM: __________ am/pm ____________ date
TO: __________ am/pm ____________ date

Test initiated: __________ am/pm ________________ date

Dilution water used: [ ] Receiving water [ ] Reconstituted water

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc. (%)	Average Dry Weight in milligrams in replicate chambers A	B	C	D	MEAN DRY WEIGHT mg	CV%*
0%						
1%						
3%						
10%						
30%						
100%						
Low Flow %						
1/2 Low Flow %						

* coefficient of variation = standard deviation x 100/mean

1. Dunnett's Procedure:

Is the mean dry weight (growth) at 7 days effluent significantly different (p=0.05) than the control's dry weight (growth) for the % effluent corresponding to:

a. LOW FLOW: ______ YES ______ NO
b. 1/2 LOW FLOW: ______ YES ______ NO

TABLE 1 (Continued)

BIOMONITORING REPORTING

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL TEST
(*Pimephales promelas*)

Permittee: Sheppard Air Force Base
NPDES No.: TX0025429

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc. (%)	Percent Survival in replicate chambers A	B	C	D	MEAN PERCENT SURVIVAL 24h	48h	7-day	CV%*
0%								
1%								
3%								
10%								
30%								
100%								
Low Flow %								
1/2 Low Flow %								

* coefficient of variation = standard deviation x 100/mean

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

   Is the mean survival at 7 days significantly different (p=0.05) than the control survival for the % effluent corresponding to:

   a. LOW FLOW: ______ YES ______ NO
   b. 1/2 LOW FLOW: ______ YES ______ NO

3. Enter percent effluent corresponding to each NOEL below and circle lowest number:

   a. NOEL survival = ________ % effluent
   b. NOEL growth = ________ % effluent

4. If you answered NO to 1.a. and 2.a., enter [N]; otherwise enter [Y]: ____

5. Enter response to item 4 on DMR Form, Parameter No. TCP6C.

6. If you answered NO to 1.b. and 2.b., enter [N]; otherwise enter [Y]: ____

7. Enter response to item 6 on DMR Form, Parameter No. TDP6C.

INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Outfall Number 001

1. During the period beginning upon the date of issuance and lasting through the July 1, 1992, the permittee is authorized to discharge subject to the following effluent limitations:

The daily average flow of effluent shall not exceed 3.4 million gallons per day (MGD); nor shall the average discharge during any two-hour period (2-hour peak) exceed 5,975 gallons per minute (gpm).

Effluent Characteristic	Discharge Limitations				Minimum Self-Monitoring Requirements Report Daily Avg. & Daily Max.	
	Daily Avg mg/l(lbs/day)	7-day Avg mg/l	Daily Max mg/l	Single Grab mg/l	Measurement Frequency	Sample Type
Flow, MGD	Report	N/A	Report	N/A	Continuous	Totalizing meter
Biochemical Oxygen Demand (5-day)	20 (567)	30	45	65	Two/week	Composite
Total Suspended Solids	20 (567)	30	45	65	Two/week	Composite

2. The effluent shall contain a chlorine residual of at least 1.0 mg/l and shall not exceed a chlorine residual of 4.0 mg/l after a detention time of at least 20 minutes (based on peak flow), and shall be monitored daily by grab sample. An equivalent method of disinfection may be substituted only with prior appr[illegible]l of the Commission.

3. The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored once per week by grab sample.

4. There shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

5. Effluent monitoring samples shall be taken at the following location(s): Following the final treatment unit.

6. The effluent shall contain a minimum dissolved oxygen concentration of 2 mg/l.

FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Outfall Number 001

1. During the period beginning upon the July 1, 1992 and lasting through the date of expiration, the permittee is authorized to discharge subject to the following effluent limitations:

The daily average flow of effluent shall not exceed 3.4 million gallons per day (MGD); nor shall the average discharge during any two-hour period (2-hour peak) exceed 5,975 gallons per minute (gpm).

Effluent Characteristic	Discharge Limitations				Minimum Self-Monitoring Requirements	
	Daily Avg mg/l(lbs/day)	7-day Avg mg/l	Daily Max mg/l	Single Grab mg/l	Report Daily Avg. & Daily Max. Measurement Frequency	Sample Type
Flow, MGD	Report	N/A	Report	N/A	Continuous	Totalizing meter
Carbonaceous Biochemical Oxygen Demand (5-day)	10 (284)	15	25	35	Two/week	Composite
Total Suspended Solids	15 (425)	25	40	60	Two/week	Composite
Ammonia Nitrogen (April-October)	3 (85)	6	10	15	Two/week	Composite

2. The effluent shall contain a chlorine residual of at least 1.0 mg/l and a maximum of 4.0 mg/l after a detention time of at least 20 minutes (based on peak flow), and shall be monitored daily by grab sample. An equivalent method of disinfection may be substituted only with prior approval of the Commission.

3. The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored once per week by grab sample.

4. There shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

5. Effluent monitoring samples shall be taken at the following location(s): following the final treatment unit.

6. The effluent shall contain a minimum dissolved oxygen concentration of 4 mg/l.

APPENDIX C

SAMPLING STRATEGY

DEPARTMENT OF THE AIR FORCE
USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (AFSC)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

REPLY TO ATTN OF: Det 6, AL/EQW

05 March 1991

SUBJECT: Sheppard AFB Wastewater Characterization Survey Sampling Strategy

TO: USAF Reg Hosp Sheppard/SGPB
3770 CES/DEEV Stop 201

1. A sampling strategy has been designed for the wastewater characterization survey to be performed by Det 6, Armstrong Lab from 22 Apr - 6 Mar 91. This sampling strategy is at Atch 1. Attachment 2 lists the analytes measured by the various screening tests we will be performing.

2. All samples taken will be analyzed for metals, volatile organics, and phenols. The metals and volatile organics are typically found in mixed (industrial and domestic) sewage. The phenols will be analyzed basewide because it has been detected in several manholes on base and its source has not been exactly located. Additional analytes will be measured as indicated on the strategy. These additional analytes are expected to be discharged by the industrial activities upstream of the manholes.

3. Bioassay testing will be performed in conjunction with the wastewater survey. It is hoped that the source of the toxicity causing failures in the biomonitoring testing will be found and can be eliminated or minimized.

4. A study of the stormwater runoff quality will also be performed if a significant rain event occurs. Sampling will be performed at the combined flightline discharge outfall (prior to entry into Clark's Pond), Clark's Pond, the unnamed tributary discharging into Plum Creek (upstream of the WWTP effluent discharge), and the Bear Creek Exit.

5. Grab samples of several oil/water separators will also be collected. These separators include the Industrial Waste Metering Tank near Site 3, the "Waste Disposal Plant" near Site 1, the Gunk Lift Station (Bldg 2009), and the POL Separator north of the WWTP (if there is evidence of floating paint solids [aka egg-drop soup]).

6. Finally, an investigation of the pervasive odor problem in the Sheppard sanitary sewer system will be conducted. Air samples will be collected and screened using infrared spectroscopy to determine if the compound causing the onion smell can be found. We believe the source of the odor is the low flow in the north side of the base which is causing extensive anoxic and/or anaerobic conditions in the manhole.

7. Please review the attached sampling strategy and provide us with comments NLT 22 March 1991. Negative replies are required. Questions concerning this letter may be addressed to me at DSN 240-3305.

Richard P. McCoy

RICHARD P. McCOY, Capt, USAF, BSC
Consultant, Water Quality Branch
Armstrong Laboratory

cc: HQ ATC/SGPB

2 Atchs:
1. Sheppard Sampling Strategy
2. List of Contaminants Analyzed

SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
Sampling Strategy

Site #	Manhole #	# of Days	Site Description	Analyses
1	N-3	3	Comm SQ Sewage	Metals, VOs, Phenol
2	K-12	3	Corr Cont, Unsched. Maint., Sched. Maint	Metals, VOs, Phenol, TPH, Surfactants
3	L-9	3	Ind. Waste Treatment Fuel Cell Repair, Chemical Cleaning	Metals, VOs, Phenol, TPH
4	K-8	6	Battery, Electro-plating, Metal Fab., Comm/Nav	Metals, VOs, CN, Phenol
5	K-3	3	Vehicle Maint.	O&G, Metals, VOs, Phenols, Surfs, TPH
6	I-12	3	Power Pro. School (Generators)	O&G, Metals, VOs, Phenols, TPH
7	I-4	3	"Poles", Paint, Metal Fab, HVAC Schools	Metals (incl. Mb), VOs, Phenol, TPH
8	G-22	3	Dental Lab School	Metals, VOs, Phenol Methyl Methacrylate (?)
9	G-19	3	Med. Lab School	Metals, VOs, Phenol,
10	G-13	3	Corr. Control	Metals, VOs, Phenol, PCP, TPH
11	H-11A (S of Bldg 2111)	3	Motorpool/Entomology	O&Gs, Pesticides, TPH, VOs, Metals, Phenols, Surfs,
12	G-7	3	Audiovisual	Metals [esp. Ag, Cr(VI)] CN, VOs, NH3, Phenols
13	G-1	3	Aircraft/Helicopter Mntc. Schools	Metals, VOs, Phenols TPH
14	E-51	3	Auto Hobby Shop	O&Gs, Surfs, Metals, VOs, Phenols, TPH
15	D-75	3	Aircraft/Helicopter Mntc. Schools	Metals, VOs, Phenols, TPH

SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
Sampling Strategy

Site#	Manhole #	# of Days	Site Description	Analyses
16	D-35	3	Raytheon Battery & Electric, Corr. Cont	Metals, VOs, Phenols TPH, CN
17	B-21	3	100-700 series Bldgs	Metals, VOs, Phenols
18	V2-9	3	1624, 1664, 1638	Metals, VOs, Phenols
19	V2-3	3	Housing, Admin (Domestic Waste)	Metals, VOs, Phenols
20	V2-5	8	Headworks of WWTP	Metals (incl. Mb), VOs, Phenols, P, CN, NH3, TPH, Surfs, O&G, TPH
21	WWTP Eff.	8	Effluent as it enters unnamed tributary	Metals (incl. Mb), VOs Phenols, P, CN, NH3, TPH, Surfs, O&G, TPH TTO (1)
22	E-47	6	Combined Hospital Discharge	Metals, VOs, Phenols CN, NH3, O&G
23	Front of Dental Clinic	3		Metals, VOs, CN, NH3 Phenols
24	Front (N side) of Hospital	3		Metals, VOs, Phenols, CN, NH3
25	Hospital Discharge to WF WWTP	8		Metals, VOs, Phenols, NH3, CN
26	C-16	3	CE Power Prod.	O&G, TPH, VOs, Metals

Key to Abbreviations

VOs: Volatile Organic Hydrocarbons (VOHs) and Volatile Organic Aromatics (VOAs
TPH: Total Petroleum Hydrocarbons
CN: Cyanides (Total)
O&G: Oils and Greases
Mb: Molybdenum
PCP: pentachlorophenol
Surfs: Surfactants
NH3: Ammonia
Ag: Silver
Cr(VI): Hexavalent Chromium
P: Phosphorus (Total)
TTO: Total Toxic Organics

Atch 1

LIST OF CONTAMINANTS MEASURED IN SCREENING TESTS

Screening Test	Contaminants Analyzed
Metals	Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium (total), Chromium (VI), Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Zinc
VOHs	Bromodichloromethane, Bromoform, Bromomethane, Carbon Tetrachloride, Chlorobenzene, Chloroethane, 2-Chloroethylvinyl ether, Chloroform, Chloromethane, Dibromochloromethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, cis-1,3-dichloropropene, methylene chloride, 1,1,2,2-tetrachloroethane, tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, trichlorofluoromethane, vinyl chloride
VOAs	Benzene, Chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, toluene
TTO	Chloromethane, bromomethane, vinyl chloride, chloroethane, dichloromethane, trichlorofluoromethane, 1,1-dichloroethane, 1,1-dichloroethylene, total-1,2-dichloroethylene, chloroform, 1,2-dichloroethane, 1,1,1-trichloroethane, carbon tetrachloride, bromodichloromethane, 1,2-dichloropropane, trans-1,3-dichloropropylene, trichloroethylene, benzene, chlorodibromomethane, 1,1,2-trichloroethane, cis-1,3-dichloropropylene, 2-chloroethylvinyl ether, bromoform, 1,1,2,2-tetrachloroethane, tetrachloroethane, toluene, chlorobenzene, ethyl benzene, 1,3-dichlorobenzene, 1,2 & 1,4-dichlorobenzenes, Aldrin, alpha-BHC, beta-BHC, delta-BNHC, gamma-BHC, Chlordane, DDD, DDE, p,p-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Toxaphene, Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260

Atch 2

APPENDIX D

WASTEWATEP CHARACTERIZATION SURVEY SAMPLING SITES

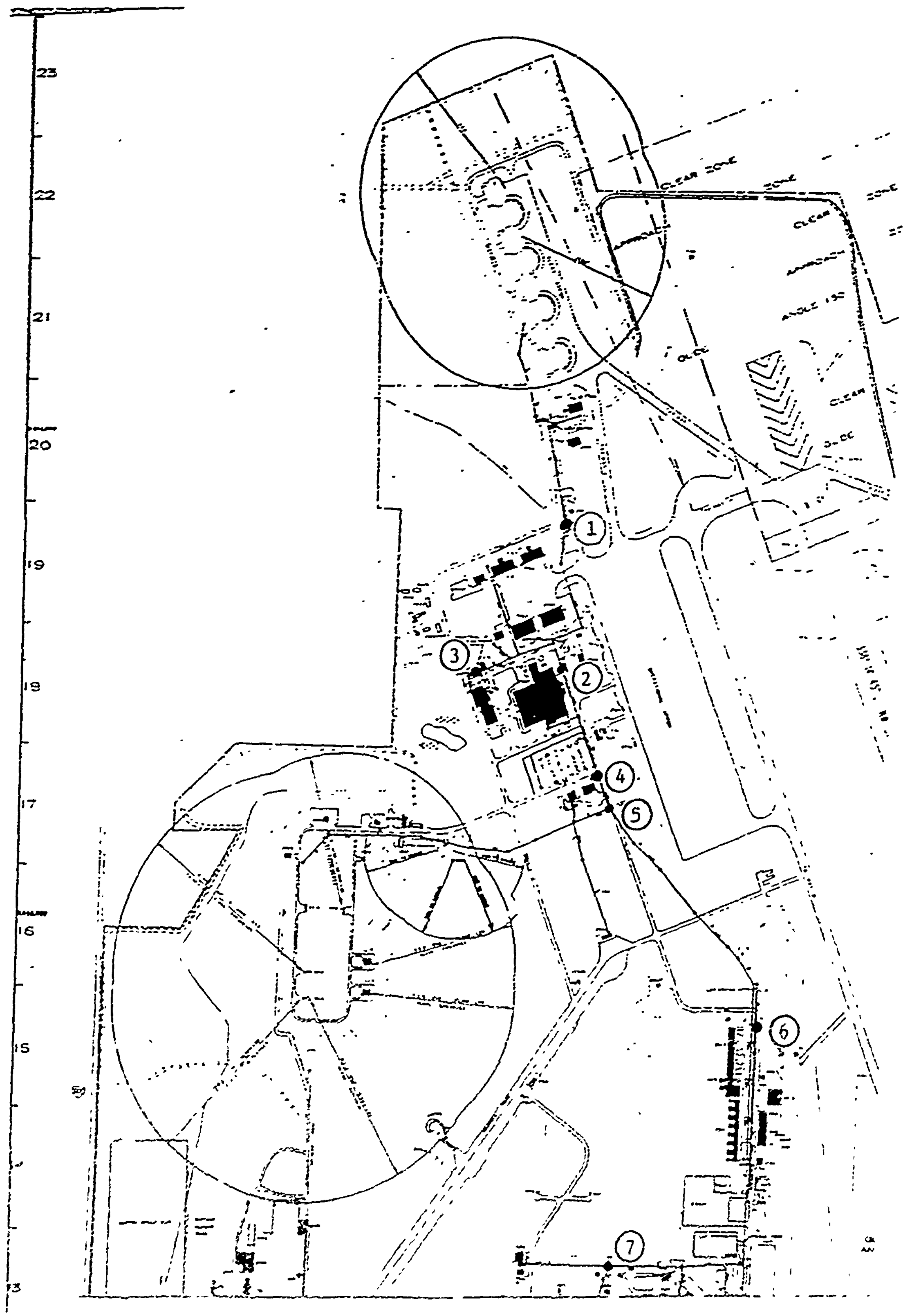


Figure D-1. Sampling site locations for north side of Sheppard AFB.

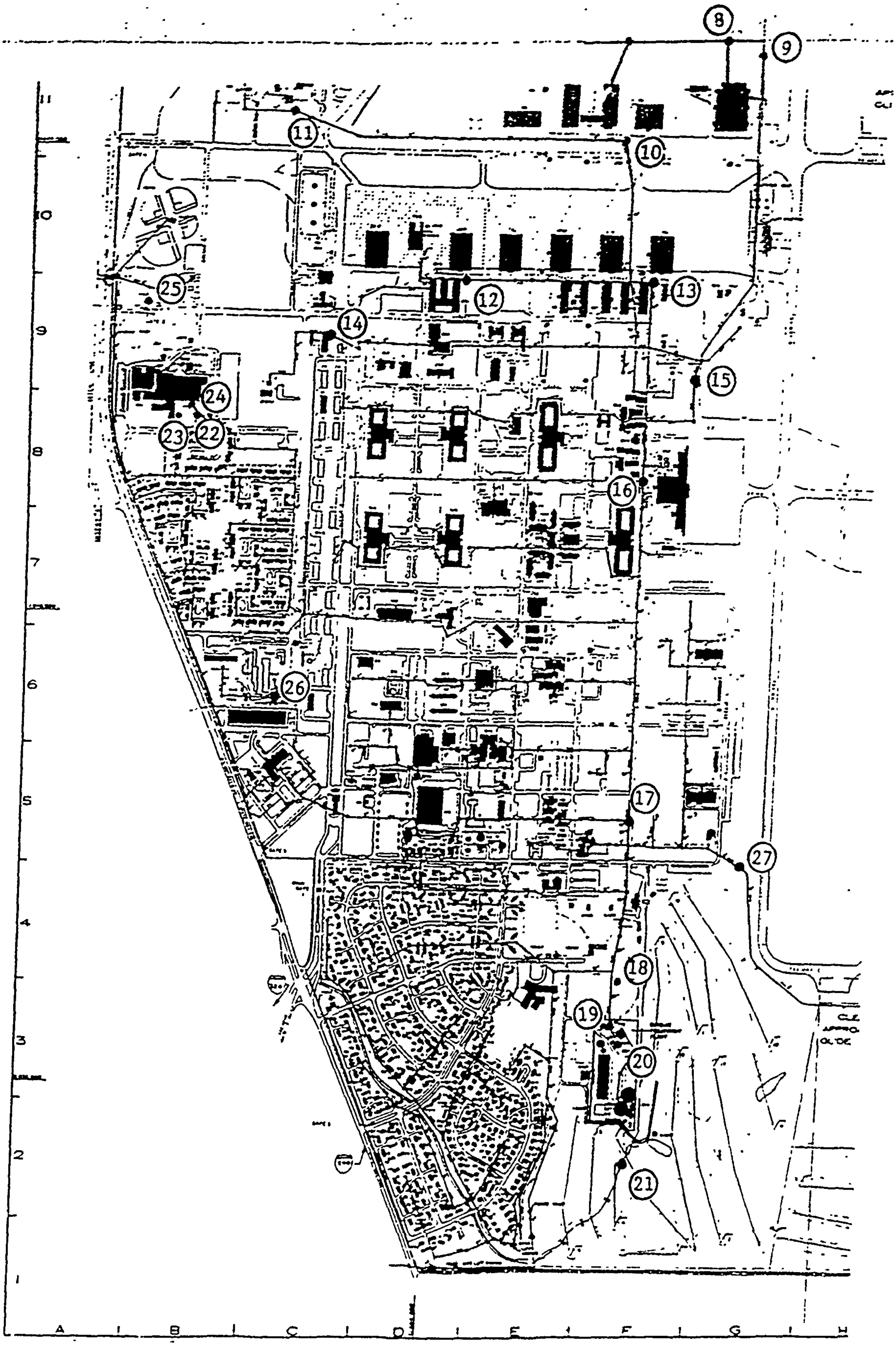


Figure D-2. Sampling site locations for south side of Sheppard AFB.

APPENDIX E

QUALITY ASSURANCE/QUALITY CONTROL SAMPLING RESULTS

TABLE E-1, Results of Blank Sample Analyses for Metals
SHEPPARD AFB WASTEWATER SURVEY
22 APRIL - 03 MAY 1991
Samples Collected on 01 May 1991

ANALYTE	UNITS	SITE #22	SITE #16	TEAM 1	TEAM 1
Arsenic	ug/l	<10	<10	<10	<10
Barium	ug/l	<100	<100	<100	<100
Beryllium	ug/l	<10.0	<10.0	<10.0	<10.0
Cadmium	ug/l	<10.0	<10.0	<10.0	<10.0
Chromium	ug/l	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50
Copper	ug/l	<20	<20	<20	<20
Iron	ug/l	<100	<100	<100	<100
Lead	ug/l	<20	<20	<20	<20
Magnesium	mg/l	<0.1	<0.1	<0.1	<0.1
Manganese	ug/l	<50	<50	<50	<50
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0
Molybdenum	ug/l	<100	<100	<100	<100
Nickel	ug/l	<50	<50	<50	<50
Silver	ug/l	<10.0	<10.0	<10.0	<10.0
Zinc	ug/l	<50	<50	<50	<50

TABLE E-2, Results of Blank Sample Analyses for Volatile Organic Aromatics SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 Samples Collected on 01 May 1991					
ANALYTE	UNITS	TEAM 1	TEAM 1	TEAM 2	TEAM 2
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6	<0.6
Toluene	ug/l	1.9	<0.3	<0.3	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0
p-Xylene	ug/l	2.8			
o-Xylene	ug/l	0.9			

TABLE E-3, Results of Blank Sample Analyses for Volatile Organic Hydrocarbons SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 Samples Collected on 01 May 1991					
ANALYTE	UNITS	TEAM 1	TEAM 1	TEAM 2	TEAM 2
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9	<0.9
Chloromethane	ug/l	<0.8	<0.8	<0.8	<0.8
Methylene Chloride	ug/l	24	<0.4	<0.4	<0.4
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3	<0.3
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3	<0.3
cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	ug/l	16	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9	<0.9
2-Chloroethylvinyl ether	ug/l	<0.9	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3	<0.3	<0.3

TABLE E-4, Results of Blank Sample Analyses for Miscellaneous Analyses
SHEPPARD AFB WASTEWATER SURVEY
22 APRIL - 03 MAY 1991
Samples Collected on 01 May 1991

ANALYTE	UNITS	SITE #22	SITE #16	TEAM 1	TEAM 1
Ammonia	mg/l	<0.1	<0.1	0.1	<0.1
Phosphorus	mg/l	<0.1	<0.1	0.55	0.18
Cyanide	mg/l	<0.005			
Phenol	ug/l	<10.0			
Surfactants - MBAS	mg/l	<0.1			
Oils And Greases	mg/l	4.7	<0.3	<0.3	<0.3
Total Pet. Hydrocarbons	mg/l	0.6	<1.0	<1.0	<1.0

APPENDIX F

VOLATILE ORGANIC CHEMICAL SAMPLING RESULTS

TABLE F-1, Results of Volatile Organic Analyses for
Site 1, Communications Squadron
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	Units	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	14	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5

Volatile Organic Aromatics (EPA Method 602):

	Units	24 Apr	25 Apr	26 Apr
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	5.0	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-2, Results of Volatile Organic Analyses for
Site 2, Manhole K-12, Corrosion Control/Phase Dock
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	Units	29 Apr	29 Apr Dup	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3	<0.3	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	2.1	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5	7.1
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	1.5	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5	15	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	23	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	2.0	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	0.96	<0.5	<0.5
Trichloroethylene	ug/l	3.1	5.2	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9	<0.9

Volatile Organic Aromatics (EPA Method 602):

1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5	19
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6	<0.6
Toluene	ug/l	<0.3	<0.3	1.6	<0.3
Benzene	ug/l	0.31	0.79	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0
p-Xylene	ug/l		0.69	25	
m-Xylene	ug/l			1.6	
o-Xylene	ug/l		1.25		1.3

TABLE F-3, Results of Volatile Organic Analyses for
Site 3, Manhole L-9, Fuel Cell Repair
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	14	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	12
1,1,2,2-Tetrachloroethane	ug/l	18	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	14	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	20	8.0	<5
Benzene	ug/l	6	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-4, Results of Volatile Organic Analyses for
Site 4, Battery/Electroplating/Metal Fabrication
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):	UNITS:	24 Apr	25 Apr	26 Apr	30 Apr	1 May	2 May
Bromodichloromethane	ug/l	<5	<5	<5	<0.4	<0.4	<0.4
Bromoform	ug/l	<5	<5	<5	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<5	<5	<5	<0.6	<0.6	<0.6
Chloroethane	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
Chloroform	ug/l	<5	<5	<5	1.2	<0.3	1.3
Chloromethane	ug/l	<5	<5	<5	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<5	<5	<5	<0	<0.9	<0.9
1,1-Dichloroethane	ug/l	<5	<5	<5	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<5	<5	<5	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<5	<5	<5	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5	<0.5	3.3	<0.5
1,2-Dichloropropane	ug/l	<5	<5	<5	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<5	<5	16	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<5	330	107	<0.4	6.6	<0.4
1,1,2,2-Tetrachloroethane	ug/l	290	<5	<5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<5	260	<5	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<5	27	<5	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<5	<5	<5	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
Bromomethane	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):							
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<5	<5	<5	0.40	<0.3	<0.3
Chlorobenzene	ug/l	<5	<5	<5	1.0	<0.6	<0.6
Toluene	ug/l	<5	10	<5	4.5	0.4[illegible]	<0.3
Benzene	ug/l	<5	<5	<5	0.61	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<1.0	<1.0	<1.0
p-Xylene	ug/l				0.79	0.60	
m-Xylene	ug/l	See Comment Below					
o-Xylene	ug/l				1.4	<0.3	

p- and m-xylene coelute.
p-Xylene result is sum of m- and p-Xylene.

TABLE F-5, Results of Volatile Organic Analyses for
Site 5, Vehicle Maintenance
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):	UNITS	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	6.5	<0.3	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	2.7	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	3.2	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	1.3
Toluene	ug/l	<0.3	0.43	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	7.1
p-Xylene	ug/l	0.79	0.50	
m-Xylene		See comment		
o-Xylene	ug/l	1.4	<0.3	

p-Xylene result is sum of m- and p-xylenes
p- and m-Xylene coelute

TABLE F-6, Results of Volatile Organic Analyses for Site 6, Power Prod. Schools/Generators SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-7, Results of Volatile Organic Analyses for
Site 7, "Poles" School, Paint/Metal Fab/HVAC Schools
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9

Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	<0.3	<0.3	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0

TABLE F-8, Results of Volatile Organic Analyses for Site 8, Dental Lab School
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602)				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-9, Results of Volatile Organic Analyses for Site 9, Medical Lab School. SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	0.67	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	0.64	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	0.78
Ethyl Benzene	ug/l	0.53	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	12	<0.3	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0

TABLE F-10, Results of Volatile Organic Analyses for Site 10, Corrosion Control
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	8.0	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-1 Results of Volatile Organic Analyses for
Site 11, Motorpool/Entomology
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL – 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3	1.2
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	23	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	0.95
1,4-Dichlorobenzene	ug/l	23	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	<0.3	0.55	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
p-Xylene	ug/l	1.5		
m-Xylene	See comment			
o-Xylene	ug/l	1.1		

p-Xylene result is sum of m- and p-xylene.
p- and m-Xylene coelute.

TABLE F-12, Results of Volatile Organic Analyses for
Site 12, Audiovisual
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbcn Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	13	10	<5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	11
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-13, Results of Volatile Organic Analyses for Site 13, Aircraft/Helicopter Schools
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	<5	7.0
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-14, Results of Volatile Organic Analyses for Site 15; Aircraft/Helicopter Maint. Schools
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	No Sample Taken
Bromoform	ug/l	<5	<5	
Carbon Tetrachloride	ug/l	<5	<5	
Chlorobenzene	ug/l	<5	<5	
Chloroethane	ug/l	<5	<5	
Chloroform	ug/l	<5	8.0	
Chloromethane	ug/l	<5	<5	
Chlorodibromomethane	ug/l	<5	<5	
1,2-Dichlorobenzene	ug/l	<5	23	
1,3-Dichlorobenzene	ug/l	<5	<5	
1,4-Dichlorobenzene	ug/l	<5	18	
Dichlorodifluoromethane	ug/l	<5	<5	
1,1-Dichloroethane	ug/l	<5	<5	
1,2-Dichloroethane	ug/l	<5	<5	
1,1-Dichloroethene	ug/l	<5	<5	
Trans-1,2-Dichloroethene	ug/l	<5	<5	
1,2-Dichloropropane	ug/l	<5	<5	
Cis-1,3-Dichloropropene	ug/l	<5	<5	
Trans-1,3-Dichloropropene	ug/l	<5	<5	
Methylene Chloride	ug/l	65	55	
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	
Tetrachloroethylene	ug/l	<5	<5	
1,1,1-Trichloroethane	ug/l	<5	<5	
1,1,2-Trichloroethane	ug/l	<5	<5	
Trichloroethylene	ug/l	<5	<5	
Trichlorofluoromethane	ug/l	<5	<5	
Vinyl Chloride	ug/l	<5	<5	
2-Chloroethylvinyl Ether	ug/l	<5	<5	
Bromomethane	ug/l	<5	<5	

Volatile Organic Aromatics (EPA Method 602):

1,3-Dichlorobenzene	ug/l	<5	<5	No Sample Taken
1,4-Dichlorobenzene	ug/l	<5	<5	
Ethyl Benzene	ug/l	<5	<5	
Chlorobenzene	ug/l	<5	5.0	
Toluene	ug/l	11	23	
Benzene	ug/l	<5	<5	
1,2-Dichlorobenzene	ug/l	<5	<5	

TABLE F-15, Results of Volatile Organic Analyses for
Site 16; Raytheon Battery Shop
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):	UNITS:	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	1.0	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	<0.3	<0.3	2.8
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0

TABLE F-16, Results of Volatile Organic Analyses for
Site 17, 100-700-Series Buildings
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	1.3	<0.3
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	15	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	19	2.0	<0.3
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
p-Xylene	ug/l		2.9	
m-Xylene		See Comment		
o-xylene	ug/l		1.8	

p- and m-Xylene coelute.
p-Xylene result is sum of m- and p-xylene.

TABLE F-17, Results of Volatile Organic Analyses for
Site 18, Buildings 1624, 1664, 1638
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	17	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	22	16	51
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5

Volatile Organic Aromatics (EPA Method 602):

1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	<5
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-18, Results of Volatile Organic Analyses for
Site 19, Housing and Administrative Buildings
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7	<0.7
Carbon-Tetrachloride	ug/l	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9	<0.9
Chloroform	ug/l	<0.3	1.3	1.1
Chloromethane	ug/l	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	0.74	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	15	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9	<0.9

Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	0.74	<0.7	0.64
Ethyl Benzene	ug/l	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6	<0.6
Toluene	ug/l	19	2.0	8.1
Benzene	ug/l	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0	<1.0
p-Xylene	ug/l	0.48	2.9	
m-Xylene		See comment		
o-Xylene	ug/l	<0.3	1.9	

p-Xylene result is sum of m- and p-xylene.
p- and m-Xylene coelute.

TABLE F-19, Results of Volatile Organic Analyses for
Site 20, WWTP Influent (Page 1 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):						Dup
	UNITS:	24 Apr	25 Apr	26 Apr	27 Apr	27 Apr
Bromodichloromethane	ug/l	<5	<5	<5	<5	<5
Bromoform	ug/l	<5	<5	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5	<5	<5
Chloroform	ug/l	<5	14	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Methylene Chloride	ug/l	19	18	38	64	62
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):						
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Toluene	ug/l	5	11	8	<5	<5
Benzene	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5

TABLE F-19, Results of Volatile Organic Analyses for
Site 20, WWTP Influent (Page 2 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):						
	UNITS:	28 Apr	28 Apr	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<5	<5	<0.4	<0.4	<0.4
Bromoform	ug/l	<5	<5	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<5	<5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<5	<5	<0.6	<0.6	<0.6
Chloroethane	ug/l	<5	<5	<0.9	<0.9	<0.9
Chloroform	ug/l	<5	<5	1.6	<0.3	1.2
Chloromethane	ug/l	<5	<5	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<5	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<5	<5	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<5	<5	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<5	<5	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<5	<5	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<5	<5	<0.5	15	<0.5
1,2-Dichloropropane	ug/l	<5	<5	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<5	<5	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	20	14	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<5	<5	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<5	<5	0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<5	<5	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<5	<5	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<5	<5	<0.9	<0.9	<0.9
Bromomethane	ug/l	<5	<5	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):						
1,3-Dichlorobenzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	0.52	<0.7	0.4
Ethyl Benzene	ug/l	<5	<5	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<5	<5	<0.6	<0.6	<0.6
Toluene	ug/l	<5	7	3.3	ITG	4.9
Benzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<1.0	<1.0	<1.0
p-Xylene	ug/l			0.35		
o-Xylene	ug/l			0.30		

ITG = Interference Too Great for
Accurate Analysis

TABLE F-20, Results of Volatile Organic Analyses for
Site 21, WWTP Effluent (Page 1 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):						Dup
	UNITS:	24 Apr	25 Apr	26 Apr	27 Apr	27 Apr
Bromodichloromethane	ug/l	<5	<5	<5	<5	<5
Bromoform	ug/l	<5	<5	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5	<5	<5
Chloroform	ug/l	<5	21	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Methylene Chloride	ug/l	15	20	15	61	15
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5	<5	<5

Volatile Organic Aromatics (EPA Method 602):						
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Toluene	ug/l	<5	<5	<5	<5	<5
Benzene	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5

TABLE F-20, Results of Volatile Organic Analyses for
Site 21, WWTP Effluent (Page 2 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):						
	UNITS:	28 Apr	28 Apr	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<5	<5	<0.4	4.7	<0.4
Bromoform	ug/l	<5	<5	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<5	<5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<5	<5	<0.6	<0.6	<0.6
Chloroethane	ug/l	<5	<5	<0.9	<0.9	<0.9
Chloroform	ug/l	<5	<5	3.3	5.6	2.7
Chloromethane	ug/l	<5	<5	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<5	<5	<0.5	.96	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<5	<5	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<5	<5	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<5	<5	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<5	<5	<0.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<5	<5	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<5	<5	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	25	47	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<5	<5	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<5	<5	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<5	<5	0.50	<0.5	<0.5
Trichlorofluoromethane	ug/l	<5	<5	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<5	<5	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<5	<5	<0.9	<0.9	<0.9
Bromomethane	ug/l	<5	<5	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):						
1,3-Dichlorobenzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<5	<5	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<5	<5	<0.6	<0.6	<0.6
Toluene	ug/l	<5	<5	<0.3	<0.3	<0.3
Benzene	ug/l	<5	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<1.0	<1.0	<1.0

TABLE F-21, Results of Volatile Organic Analyses for
Site 22, Combined Hospital Discharge
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	UNITS:	24 Apr	25 Apr	26 Apr	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<5	<5	<5	0.98	<0.4	<0.4
Bromoform	ug/l	<5	<5	<5	<0.7	<0.7	<0.7
Carbon Tetrachloride	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l	<5	<5	<5	<0.6	<0.6	<0.6
Chloroethane	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
Chloroform	ug/l	<5	6.0	<5	1.7	<0.3	<0.3
Chloromethane	ug/l	<5	<5	<5	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<5	<5	<5	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<5	<5	<5	<1.0	<0.3	<0.3
1,1-Dichloroethene	ug/l	<5	<5	<5	<0.4	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<5	<5	<5	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	7	14	10	<0.4	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<5	<5	<5	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<5	<5	<5	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<5	<5	<5	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5	<0.9	<0.9	<0.9
Bromomethane	ug/l	<5	<5	<5	<0.9	<0.9	<0.9

Volatile Organic Aromatics (EPA Method 602):

	UNITS:	24 Apr	25 Apr	26 Apr	29 Apr	30 Apr	1 May
1,3-Dichlorobenzene	ug/l	<5	<5	<5	No	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	Sample	<0.7	.96
Ethyl Benzene	ug/l	<5	<5	<5	Recv'd	<0.3	<0.3
Chlorobenzene	ug/l	<5	<5	<5		<0.6	<0.6
Toluene	ug/l	<5	<5	<5		<0.3	2.1
Benzene	ug/l	<5	<5	<5		<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<5	<5		<1.0	<1.0
p-Xylene	ug/l					2	
o-Xylene	ug/l					<0.3	
m-Xylene	ug/l					<0.3	

TABLE F-22, Results of Volatile Organic Analyses for
Site 24 Hospital Clinical Labs
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):	UNITS:	24 Apr	25 Apr	26 Apr
Bromodichloromethane	ug/l	<5	<5	<5
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	16	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	14	13
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	9	<5
Benzene	ug/l	<5	5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-23, Results of Volatile Organic Analyses for
Site 25, Hospital Discharge to North Side Plant (Page 1 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):

	UNITS:	24 Apr	25 Apr	26 Apr	27 Apr	27 Apr
Bromodichloromethane	ug/l	<5	<5	<5	<5	<5
Bromoform	ug/l	<5	<5	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5	<5	<5
Chloroform	ug/l	<5	18	<5	<5	<5
Chloromethane	ug/l	<5	<5	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5	<5	<5
Methylene Chloride	ug/l	13	13	12	49	480
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5	<5	<5

Volatile Organic Aromatics (EPA Method 602):

1,3-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5	<5	<5
Toluene	ug/l	12	9	<5	<5	<5
Benzene	ug/l	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5	<5	<5

TABLE F-23, Results of Volatile Organic Analyses for
Site 25, Hospital Discharge to North Side Plant (Page 2 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):					
	UNITS:	28 Apr	29 Apr	30 Apr	1 May
Bromodichloromethane	ug/l	<5	<0.4	<0.4	<.4
Bromoform	ug/l	<5	<0.7	<.7	<.7
Carbon Tetrachloride	ug/l	<5	<0.5	<0.5	<.5
Chlorobenzene	ug/l	<6	<0.6	<0.6	<0.6
Chloroethane	ug/l	<5	<0.9	<0.9	<0.9
Chloroform	ug/l	<5	12	<0.3	5.6
Chloromethane	ug/l	<5	<0.8	<0.8	<0.8
Chlorodibromomethane	ug/l	<5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<0.7	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<5	<0.9	<0.9	<0.9
1,1-Dichloroethane	ug/l	<5	<0.4	<0.4	<0.4
1,2-Dichloroethane	ug/l	<5	<0.3	<0.3	<0.3
1,1-Dichloroethene	ug/l	<5	4.3	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/l	<5	<0.3	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<5	<0.5	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<5	<0.5	<0.5	<0.5
Methylene Chloride	ug/l	16	<0.4	<0.4	4.4
1,1,2,2-Tetrachloroethane	ug/l	<5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/l	<5	<0.6	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<5	<0.5	<0.5	<0.5
Trichloroethylene	ug/l	<5	<0.5	<0.5	<0.5
Trichlorofluoromethane	ug/l	<5	<0.4	<0.4	<0.4
Vinyl Chloride	ug/l	<5	<0.9	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<5	<0.9	<0.9	<0.9
Bromomethane	ug/l	<5	<0.9	<0.9	<0.9
Volatile Organic Aromatics (EPA Method 602):					
1,3-Dichlorobenzene	ug/l	<5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<5	<0.7	<0.7	<0.7
Ethyl Benzene	ug/l	<5	<0.3	<0.3	<0.3
Chlorobenzene	ug/l	<5	<0.6	<0.6	<0.6
Toluene	ug/l	<5	<0.3	<0.3	1.1
Benzene	ug/l	<5	<0.6	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<5	<1.0	<1.0	<1.0

TABLE F-24, Results of Volatile Organic Analyses for Site 26, CE Power Production SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
Volatile Organic Hydrocarbons (EPA Method 601):				
	UNITS:	24 Apr	25 Apr	26 Apr
Bromoform	ug/l	<5	<5	<5
Carbon Tetrachloride	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Chloroethane	ug/l	<5	<5	<5
Chloroform	ug/l	<5	15	<5
Chloromethane	ug/l	<5	<5	<5
Chlorodibromomethane	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Dichlorodifluoromethane	ug/l	<5	<5	<5
1,1-Dichloroethane	ug/l	<5	<5	<5
1,2-Dichloroethane	ug/l	<5	<5	<5
1,1-Dichloroethene	ug/l	<5	<5	<5
Trans-1,2-Dichloroethene	ug/l	<5	<5	<5
1,2-Dichloropropane	ug/l	<5	<5	<5
Cis-1,3-Dichloropropene	ug/l	<5	<5	<5
Trans-1,3-Dichloropropene	ug/l	<5	<5	<5
Methylene Chloride	ug/l	<5	25	5
1,1,2,2-Tetrachloroethane	ug/l	<5	<5	<5
Tetrachloroethylene	ug/l	<5	<5	<5
1,1,1-Trichloroethane	ug/l	<5	<5	<5
1,1,2-Trichloroethane	ug/l	<5	<5	<5
Trichloroethylene	ug/l	<5	<5	<5
Trichlorofluoromethane	ug/l	<5	<5	<5
Vinyl Chloride	ug/l	<5	<5	<5
2-Chloroethylvinyl Ether	ug/l	<5	<5	<5
Bromomethane	ug/l	<5	<5	<5
Volatile Organic Aromatics (EPA Method 602):				
1,3-Dichlorobenzene	ug/l	<5	<5	<5
1,4-Dichlorobenzene	ug/l	<5	<5	<5
Ethyl Benzene	ug/l	<5	<5	<5
Chlorobenzene	ug/l	<5	<5	<5
Toluene	ug/l	<5	<5	7
Benzene	ug/l	<5	<5	<5
1,2-Dichlorobenzene	ug/l	<5	<5	<5

TABLE F-25, Results of Volatile Organic Analyses for
Site 27, Wichita Falls Muncipal Airport
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

Volatile Organic Hydrocarbons (EPA Method 601):			
	UNITS:	30 Apr	1 May
Bromodichloromethane	ug/l	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9
Chloroform	ug/l	1.5	2.0
Chloromethane	ug/l	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3
Trans-1,2-Dichloroethene	ug/l	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3
Cis-1,3-Dichloropropene	ug/l	<0.5	<0.5
Trans-1,3-Dichloropropene	ug/l	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9
2-Chloroethylvinyl Ether	ug/l	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9

Volatile Organic Aromatics (EPA Method 602):			
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6
Toluene	ug/l	<0.3	.46
Benzene	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0

APPENDIX G

METALS RESULTS

TABLE G-1, Results of Metals Analyses for
Site 1, Communications Squadron
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	200	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	180	60	40
Iron	ug/l	4500	2200	890
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	8.3	7.8	8.2
Manganese	ug/l	80	60	50
Mercury	ug/l	<1	<1	<1
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	550	150	70

TABLE G-2, Results of Metals Analyses for
Site 2, Manhole K-12, Corrosion Control/Phase Dock
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	29 Apr	29 Apr Dup	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10	<10
Barium	ug/l	170	130	100	<100
Beryllium	ug/l	<10	<10	<10	<10
Boron	ug/l	2200		2700	2200
Cadmium	ug/l	54	44	31	50
Chromium	ug/l	120	130	230	210
Chromium VI	ug/l	<50	<50	<50	<50
Copper	ug/l	140	120	80	110
Iron	ug/l	8100	5900	5900	6200
Lead	ug/l	330	220	180	180
Magnesium	mg/l	9.0	8.7	8.4	9.4
Manganese	ug/l	110	100	90	
Mercury	ug/l	<1	<1	<1	<1
Nickel	ug/l	<50	<50	<50	<50
Selenium	ug/l				<10
Silver	ug/l	1200	270	750	820
Zinc	ug/l	400	140	230	530

TABLE G-3, Results of Metals Analyses for Site 3, Manhole L-9, Fuel Cell Repair SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	120
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	63	69	31
Chromium	ug/l	50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	150	120	230
Iron	ug/l	2100	1300	3000
Lead	ug/l	90	100	80
Magnesium	mg/l	7.9	7.6	7.4
Manganese	ug/l	60	50	90
Mercury	ug/l	<1	<1	<1
Nickel	ug/l	200	<50	60
Silver	ug/l	<10	<10	<10
Zinc	ug/l	300	220	980

TABLE G-4, Results of Metals Analyses for Site 4, Battery/Electroplating/Metal Fabrication SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991							
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr	30 Apr	1 May	2 May
Arsenic	ug/l	<10	<10	<10	<10	<10	<10
Barium	ug/l	<100	<100	400	500	1000	2600
Beryllium	ug/l	<10	<10	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	14	10	31	80
Chromium	ug/l	<50	<50	<50	50	160	310
Chromium VI	ug/l	<50	<50	<50	<50	<50	<50
Copper	ug/l	20	40	70	60	140	330
Iron	ug/l	490	790	2600	1400	5000	9700
Lead	ug/l	<20	<20	30	55	470	350
Magnesium	mg/l	5.8	6.8	8.0	7.8	8.9	11.0
Manganese	ug/l	<50	<50	80	60	100	
Mercury	ug/l	<1	<1	<1	<1	<1	<1
Nickel	ug/l	<50	<50	<50	<50	<50	140
Silver	ug/l	<10	12	52	270	820	1100
Zinc	ug/l	80	90	290	140	390	930

TABLE G-5, Results of Metals Analyses for Site 5, Vehicle Maintenance SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	300	200
Beryllium	ug/l	<10	<10	<10
Boron	ug/l	1300		1300
Cadmium	ug/l	<10	19	20
Chromium	ug/l	<50	290	230
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	40	130	100
Iron	ug/l	1500	6300	4100
Lead	ug/l	42	140	
Magnesium	mg/l	7.8	8.6	
Manganese	ug/l	60	110	
Mercury	ug/l	<1	<1	<1.0
Nickel	ug/l	<50	<50	90
Silver	ug/l	160	290	110
Zinc	ug/l	90	350	290

TABLE G-6, Results of Metals Analyses for Site 6, Power Prod. School/Generators SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	310	<100
Beryllium	ug/l	<10	<10	<10
Boron	ug/l		4900	
Cadmium	ug/l	<10	10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	20	120	60
Iron	ug/l	650	4500	520
Lead	ug/l	<20	90	<20
Magnesium	mg/l	7.2	12	8.7
Manganese	ug/l	<50	250	60
Mercury	ug/l	55	5	1
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	80	1100	170

TABLE G-7, Results of Metals Analyses for Site 7, "Poles" School, Paint/Metal Fab/HVAC Schools SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL – 03 MAY 1991				
ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	No Results Received
Barium	ug/l	<100	<100	
Beryllium	ug/l	<10	<10	
Cadmium	ug/l	<10	<10	
Chromium	ug/l	<50	220	
Chromium VI	ug/l	<50	<50	
Copper	ug/l	120	50	
Iron	ug/l	800	1400	
Lead	ug/l	14	<20	
Magnesium	mg/l	10	10	
Manganese	ug/l	<50	<50	
Mercury	ug/l	<1	<1	
Nickel	ug/l	<50	<50	
Silver	ug/l	<10	<10	
Zinc	ug/l	110	140	

TABLE G-8, Results of Metals Analyses for Site 8, Dental Lab School SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL – 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	50	50	80
Iron	ug/l	900	600	1200
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	10	15	9.5
Manganese	ug/l	100	140	70
Mercury	ug/l	15	4	2
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	140	100	150

TABLE G-9, Results of Metals Analyses for Site 9, Medical Lab School SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	12000	1800	170
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	40	<10	<10
Chromium	ug/l	3700	280	60
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	7600	1300	160
Iron	ug/l	270000	21000	4100
Lead	ug/l	2700	220	21
Magnesium	mg/l	38.0	18.0	11.0
Manganese	ug/l	1600	320	100
Mercury	ug/l	880	65	6.2
Nickel	ug/l	450	<50	<50
Silver	ug/l	1200	460	240
Zinc	ug/l	27000	3000	390

TABLE G-10, Results of Metals Analyses for Site 10, Corrosion Control SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	120	60	50
Iron	ug/l	1200	1300	680
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	21.0	8.9	35.0
Manganese	ug/l	60	<50	80
Mercury	ug/l	2	<1	<1
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	11	<10
Zinc	ug/l	300	80	110

TABLE G-11, Results of Metals Analyses for
Site 11, Motorpool/Entomology
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	40	20	50
Iron	ug/l	700	600	3200
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	22	63	33
Manganese	ug/l	50	70	160
Mercury	ug/l	<1	<1	<1
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	60	50	510
Boron	ug/l	700	650	650

TABLE G-12, Results of Metals Analyses for
Site 12, Audiovisual
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	<20	90	<20
Iron	ug/l	180	730	180
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	6.9	8.3	7.7
Manganese	ug/l	<50	<50	<50
Mercury	ug/l	<1	<1	1
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	12	<10
Zinc	ug/l	<50	60	<50

TABLE G-13, Results of Metals Analyses for Site 13, Aircraft/Helicopter Maint. Schools SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<300	<50	<50
Copper	ug/l	50	30	40
Iron	ug/l	12000	220	470
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	11	11	9.4
Manganese	ug/l	90	<50	<50
Mercury	ug/l	<1.0	<1.0	2
Nickel	ug/l	<50	<50	<50
Silver	ug/l	10	10	10
Zinc	ug/l	<50	<50	60

TABLE G-14, Results of Metals Analyses for Site 15, Aircraft/Helicopter Maint. Schools SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	10
Barium	ug/l	<100	100	220
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	11
Chromium	ug/l	<50	60	80
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	30	50	70
Iron	ug/l	1100	2500	2300
Lead	ug/l	<20	40	50
Magnesium	mg/l	5.6	8.9	9.2
Manganese	ug/l	60	80	100
Mercury	ug/l	9	6	2
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	19	20
Zinc	ug/l	110	190	280

TABLE G-15, Results of Metals Analyses for Site 16, Raytheon Battery Shop SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	40	30	30
Iron	ug/l	300	200	300
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	12.0	11.0	9.7
Manganese	ug/l	<50	<50	<50
Mercury	ug/l	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	60	60	60

TABLE G-16, Results of Metals Analyses for Site 17, 100-700-Series Buildings SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	40	30	40
Iron	ug/l	900	500	1200
Lead	ug/l	<20		<20
Magnesium	mg/l	9.5	8.5	8.5
Manganese	ug/l	<50	<50	<50
Mercury	ug/l	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	<50	190	120

TABLE G-17, Results of Metals Analyses for
Site 18, Buildings 1624, 1664, 1638
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	30	30	20
Iron	ug/l	680	230	420
Lead	ug/l	<20	<20	<20
Magnesium	mg/l	5.3	9.8	9.9
Manganese	ug/l	60	<50	<50
Mercury	ug/l	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	60	50	<50

TABLE G-18, Results of Metals Analyses for
Site 19, Housing/Administrative Buildings
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	40	60	40
Iron	ug/l	800	2200	900
Lead	ug/l	<20	36	<20
Magnesium	mg/l	12	14.0	10.0
Manganese	ug/l	60	70	<50
Mercury	ug/l	<1	<1	<1
Molybdenum	ug/l		<100	<100
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	20	20
Zinc	ug/l	80	200	110

TABLE G-19, Results of Metals Analyses for Site 20, WWTP Influent (Page 1 of 2) SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991						
						Dup
ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr	27 Apr	27 Apr
Arsenic	ug/l	<10	<10	10	10	10
Barium	ug/l	<100	<100	<100	<100	<100
Beryllium	ug/l	<10	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	<10	<10	<10
Chromium	ug/l	<50	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50
Copper	ug/l	30	30	30	40	30
Iron	ug/l	710	390	600	680	460
Lead	ug/l	<20	<20	<20	<20	<20
Manganese	ug/l	60	<50	<50	50	<50
Magnesium	mg/l	8.8	9.9	11	11	11
Mercury	ug/l	<1	<1	<1	<1.0	<1.0
Nickel	ug/l	<50	<50	<50	<50	<50
Silver	ug/l	<10	10	<10	14	<10
Molybdenum	ug/l	<100	<100	<100	<100	<100
Boron	ug/l			500	600	600
Zinc	ug/l	90	50	50	70	60

TABLE G-19, Results of Metals Analyses for Site 20, WWTP Influent (Page 2 of 2) SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991						
			Dup			
ANALYTE	UNITS:	28 Apr	28 Apr	29 Apr	30 Apr	1 May
Arsenic	ug/l	10	<10	<10	<10.0	<10
Barium	ug/l	170	120	<100	<100	<100
Beryllium	ug/l	<10	<10	<10	<10.0	<10
Cadmium	ug/l	<10	<10	<10	<10.0	<10
Chromium	ug/l	<50	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50
Copper	ug/l	40	40	30	<20	30
Iron	ug/l	4400	3300	600	400	1000
Lead	ug/l	60	50	<20	<20	<20
Manganese	ug/l	90	80	<50	<50	<50
Magnesium	mg/l	12	11	11	10	9.7
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50	<50	<50
Silver	ug/l	<10	<10	<10	<10.0	10
Molybdenum	ug/l	<100	<100	<100	<100	<100
Boron	ug/l	600	600	2000	500	600
Zinc	ug/l	310	260	80	70	110

TABLE G-20, Results of Metals Analyses for
Site 21, WWTP Effluent (Page 1 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr	27Apr	Dup 27 Apr
Arsenic	ug/l	<10	<10	<10	10	10
Barium	ug/l	<100	<100	<100	<100	<100
Beryllium	ug/l	<10	<10	<100	<10	<10
Cadmium	ug/l	<10	<10	<10	<10	<10
Chromium	ug/l	<50	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50
Copper	ug/l	20	20	20	30	60
Iron	ug/l	630	270	340	760	1700
Lead	ug/l		<20	<20	<20	<20
Manganese	ug/l	<50	<50	<50	<50	60
Magnesium	mg/l	9.3	9	10	10	10
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50	<50	<50
Silver	ug/l	<10	11	<10	<10	<10
Molybdenum	ug/l	<100	<100		<100	<100
Boron	ug/l	2700	2750	2500	2450	
Zinc	ug/l		50	50	70	100

TABLE G-20, Results of Metals Analyses for
Site 21, WWTP Effluent (Page 2 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	28 Apr	Dup 28 Apr	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10	<10	<10
Barium	ug/l	<100	<100	<100	<100	<100
Beryllium	ug/l	<10	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	<10	<10	<10
Chromium	ug/l	<50	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50
Copper	ug/l	<20	<20	<20	<20	<20
Iron	ug/l	270	450	500	400	500
Lead	ug/l	<20	<20	<20	<20	<20
Manganese	ug/l	<50	<50	<50	<50	<50
Magnesium	mg/l	10	10	12	13	15
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50	<50	<50
Silver	ug/l	<10	<10	<10	<10	<10
Molybdenum	ug/l	<100	<100	<100	<100	<100
Boron	ug/l				2800	2300
Zinc	ug/l	50	50	<50	60	80

TABLE G-21, Results of Metals Analyses for
Site 22, Combined Hospital Discharge
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10	<10	<10	<10
Barium	ug/l	150	<100	290	<100	420	220
Beryllium	ug/l	<10	<10	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	<10	<10	<10	<10
Chromium	ug/l	<50	<50	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50	<50
Copper	ug/l	70	90	70	80	80	100
Iron	ug/l	770	1200	1100	1000	1600	1500
Lead	ug/l	<20	<20	<20	<20	<20	<20
Manganese	ug/l	<50	50	<50	<50	<50	50
Magnesium	mg/l	8	7	5.8	7.5	6.3	7.8
Mercury	ug/l	<1.0	1.0	<1.0	<1.0	1.3	3.8
Nickel	ug/l	<50	<50	<50	<50	<50	<50
Silver	ug/l	<10	<10	<50	<10	<10	<10
Zinc	ug/l	130	200	120	140	160	230

TABLE G-22, Results of Metals Analyses for
Site 24, Hospital Clinical Labs
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	190	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	90	60	60
Iron	ug/l	1200	770	590
Lead	ug/l	<20	<20	<20
Manganese	ug/l	<50	<50	<50
Magnesium	mg/l	5.5	5.1	6.2
Mercury	ug/l	1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	170	90	100

TABLE G-23, Results of Metals Analyses for
Site 25, Hospital Discharge to North Side Plant (Page 1 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

					Dup
ANALYTE	UNITS:	25 Apr	26 Apr	27 Apr	27 Apr
Arsenic	ug/l	<10	<10	<10	<10
Barium	ug/l	<100	<100	130	<100
Beryllium	ug/l	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	<10	<10
Chromium	ug/l	<50	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50	<50
Copper	ug/l	40	40	80	40
Iron	ug/l	470	390	1100	750
Lead	ug/l	<20	<20	20	<20
Manganese	mg/l	<50	<50	<50	<50
Magnesium	ug/l	6	6.3	6.7	6.5
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50	<50
Silver	ug/l	12	<10	21	<10
Zinc	ug/l	<50	<50	80	<50

TABLE G-23, Results of Metals Analyses for
Site 25, Hospital Discharge to North Side Plant (Page 2 of 2)
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

			Dup			
ANALYTE	UNITS:	28 Apr	28 Apr	29 Apr	30 Apr	1 May
Arsenic	ug/l	10	<10	<10	<10	<10
Barium	ug/l	310	280	210	<100	<100
Beryllium	ug/l	<10	<10	<10	<10	<10
Cadmium	ug/l	<10	<10	<10	<10	<10
Chromium	ug/l	<50	<50	70	130	<50
Chromium VI	ug/l	<50	<50	<50	<50	<50
Copper	ug/l	40	30	50	40	40
Iron	ug/l	740	410	800	400	600
Lead	ug/l	<20	<20	<20	<20	<20
Manganese	mg/l	<50	<50	<50	<50	<50
Magnesium	ug/l	6.5	6.6	6.8	7.1	6.5
Mercury	ug/l	<1.0	<1.0	<1.0	<1.0	1.0
Nickel	ug/l	<50	<50	<50	<50	<50
Silver	ug/l	27	19	70	20	40
Zinc	ug/l	50	<50	70	<50	<50

TABLE G-24, Results of Metals Analyses for
Site 26, CE Power Production
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	24 Apr	25 Apr	26 Apr
Arsenic	ug/l	<10	<10	10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l.	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	20	30	20
Iron	ug/l	1400	720	600
Lead	ug/l	<20	<20	<20
Manganese	ug/l	180	60	70
Magnesium	mg/l	16	17	22
Mercury	ug/l	<1.0	<1.0	<1.0
Nickel	ug/l	<50	<50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	90	<50	50

TABLE G-25, Results of Metals Analyses for
Site 27, Wichita Falls Municipal Airport
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS:	29 Apr	30 Apr	1 May
Arsenic	ug/l	<10	<10	<10
Barium	ug/l	<100	<100	<100
Beryllium	ug/l	<10	<10	<10
Cadmium	ug/l	<10	<10	<10
Chromium	ug/l	<50	<50	<50
Chromium VI	ug/l	<50	<50	<50
Copper	ug/l	<20	<20	<20
Iron	ug/l	400	100	200
Lead	ug/l	<20	<20	<20
Manganese	ug/l	<50	<50	<50
Magnesium	mg/l	7.1	6.2	6.4
Mercury	ug/l	<1.0	<1.0	<1.0
Nickel	ug/l	<50	50	<50
Silver	ug/l	<10	<10	<10
Zinc	ug/l	<50	<50	<50

APPENDIX H

OTHER RESULTS

TABLE H-1, Results of Phenol Analyses SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 (All Concentrations in ug/l)								
SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
1	92	100	110					
2						450/375	320	168
3	160	127	290					
4	1060	1770	1090			122	168	108
5						132	275	95
6	71	178	88					
7						96	42	132
8	60	53	105					
9						190	78	<10
10	60	24	17					
11						58	27	39
12	33	23	<10					
13	22	18	29					
15	233	208	306					
16						<10	<10	<10
17						20	32	50
18	<10	<10	<10					
19	28	27	38					
20			55	25/47	60/43	35	32	27
21		15	18	<10/10	10/<10	10	<10	10
22	116	78	67			81	32	55
24	85	78	64					
25	10	27	10	<10/<10	<10/<10	18	24	10
27						10	<10	<10

Note: Discharge standard for all sites is 50 ug/l, except for Site 22, Hospital Discharge to North Side Plant

TABLE H-2, Results of Ammonia Analyses SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 (All Concentrations in mg/l)								
SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
2						21.8/1.1	23.3	3.3
12	<0.1	2.3	1.2					
20	0.4	0.2	<0.1	<0.1/<0.1	<0.1/<0.1	20.6	1.8	6.7
21	0.4	0.5	0.4	0.4/0.4	0.4/0.4	23.3	0.3	0.3
22	1.2	<0.1	0.4			22	23.7	22.2
24	<0.1	1.2	0.4					
25	2.3	1.9	1.1	2/1.9	<0.1/<0.1	22.4	22.7	22.8

TABLE H-3, Results of Cyanide Analyses SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 (All Concentrations in mg/l)								
SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
2						.005/.006	0.033	0.43
4	<.005	0.008	0.015			0.006	0.033	0.025
11	0.012	<.005	<.005					
16						<.005	<.005	<.005
20	0.008	0.012	0.008	<.005	<.005	0.165	0.023	0.018
20 Dup				<.005	<.005			
21	0.2	<.005	0.14	<.005	0.014	0.165	0.076	0.08
21 Dup				0.18	0.188			
22	<.005	0.005	<.005			0.005	<.005	0.012
24	<.005	<.005	<.005					
25	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
25 Dup				<.005	<.005			

TABLE H-4, Results of Phosphorus Analyses SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 (All Concentrations in mg/l)								
SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
20	2.2	5.5	5.2	6.2/5.8	6.8/7.8	6	6.9	7.4
21	4.9	4.8	5.2	4.6/4.4	5.4/5.5	5.9	6.7	5.3
22						6.8		

TABLE H-5, Results of Surfactant (MBAS) Analyses SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991 (All Concentrations in mg/l)								
SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
2						.2/.3	0.2	0.4
5						0.4	0.4	0.1
6		0.4						
11						0.3	0.3	0.2
20	2.3	2.6	2.6	5.1/1.0	7.6/7.4	0.2	0.3	1.1
21	0.3	0.2	0.3	.2/.3	.2/.2	0.3	0.2	0.3

TABLE H-6, Results of Total Petroleum Hydrocarbon (TPH) Analyses
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991
(All Concentrations in mg/l)

SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
2						22.4	11.4	17.6
3	199.2	22.8						
5						25.6	12.8	14.4
6	1.6	7.3	<2.0					
7						4.2	11.2	6.4
10	1.8	3.7	1.2					
11						5.9	2.2	20.8
13	2.4	6.4	<1.0					
15	19.2	33.2	27.2					
16						<1.0	<1.0	<1.0
20	10.4	3.7	5.4	6.6/6.7	6.4/9.6	224	4.8	6.4
21	<1.0	2.6	2.3	<1.0	<1.0/<1.0	1	1.6	0.6
22	2.6	6.4	1.6					
26	76.8	3.2	9.6					
27						<1.0	1.3	1.6

TABLE H-7, Results of Oils & Greases Analyses
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991
(All Concentrations in mg/l)

SITE	24 Apr	25 Apr	26 Apr	27 Apr	28 Apr	29 Apr	30 Apr	1 May
5						81.6	26.4	14.4
6	39.2	33.2	9.4					
11						10.6	7.4	20.8
16						<0.3	<0.3	0.5
20	30	131.4	48	53.8/84.8	60.0/66.4	1360	48.8	55.2
21	1.3	5.4	5.8	0.9	3.2/1.4	5.6	1.6	1.2
22	21.8	64	24.9			25.6	24.7	17.6
26	179.2	22.4	44.8					
27						1.6	9.4	17.8

TABLE H-8; Results of Pesticides Analyses
SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY
22 APRIL - 03 MAY 1991
(All Concentrations in ug/l)

	DATE:	29 Apr	29 Apr	30 Apr	30 Apr	01 May	01 May
ANALYTE	SITE:	Site 7	Site 11	Site 7	Site 11	Site 7	Site 11
Dylox		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromacil		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Simazine		<5.0	<5.0	<5.0	<5.0	18	<5.0
Diazinon		<0.1	73	<0.1	36	<0.1	21
Malathion		<0.1	1.2	<0.1	0.96	<0.1	1.8
Dursban		0.05	20	0.02	110	0.03	5.1
Baygon			<10.0	<10.0	<10.0	<10.0	<10.0
Sevin			<5.0	<5.0	<5.0	<5.0	<5.0
Ficam			<5.0	<5.0	<5.0	<5.0	<5.0
Pyrethrin			20		80		8
Diuron			<2		<2		<2
2,4-D			8.6			<0.98	<0.98
Dalapon			<0.54			1.9	<0.54
Dicamba			<0.05			0.07	1.6
DCPA			<0.05			<0.05	<0.05

APPENDIX I

MICROTOX BIOASSAY RESULTS

TABLE I-1

Sample Collection Information for Toxicity Tests

Date*	Location	Sample Number	EC50	Slope
24 April 91	WWTP Influent	CN910333	17.0	0.65
24 April 91	WWTP Effluent	CN910336	>100	--
25 April 91	WWTP Influent	CN910375	7.1	0.54
25 April 91	WWTP Effluent	CN910378	>100	--
26 April 91	WWTP Influent	CN910416	5.6	0.68
26 April 91	WWTP Effluent	CN910419	>100	--
27 April 91	WWTP Influent	CN910425	18.5	0.76
27 April 91	WWTP Effluent	CN910431	>100	--
28 April 91	WWTP Influent	CN910444	9.4	1.08
28 April 91	WWTP Effluent	CN910452	>100	--
29 April 91	WWTP Influent	CN910502	14.6	0.51
29 April 91	WWTP Effluent	CN910499	>100	--
29 April 91	WF Airport Effluent	CN910506	>100	--
29 April 91	SAFB minus Apt.	CN910495	34.1	0.95
29 April 91	FWT area	CN910466	7.2	0.73
30 April 91	WWTP Influent	CN910488	8.8	1.23
30 April 91	WWTP Effluent	CN910503	>100	--

* Date is when sample was initiated. Sample was collected for the subsequent 24-h period.

MICROTOX DATA REPORT

FILE NAME: i2a.05

REPORT DATE: 10-09-1991
TIME: 00:01:07

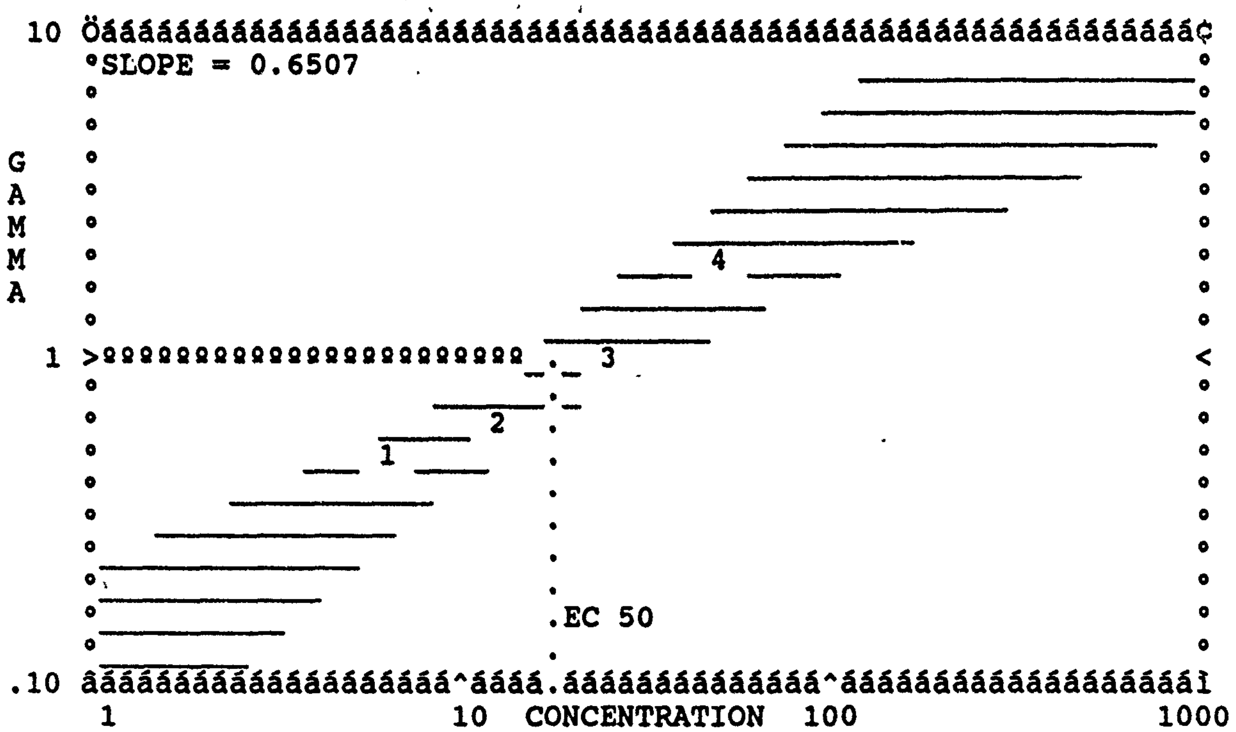
Sample Description:
Appendix I2A Sample CN910333

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	76/ 38	5.6250	0.56044
2	95/ 45	11.2500	0.64713
3	72/ 26	22.5000	1.16061
4	96/ 25	45.0000	1.99604

BLANK BO/BT = 91/ 71 BLANK RATIO = 0.7802



EC 50 = 16.98 % (95% CONFIDENCE RANGE: 9.98 TO 28.90)

TOXICITY UNITS = 5.9 (95% CONFIDENCE RANGE IS 3.5 TO 10.0)

MICROTOX DATA REPORT

FILE NAME: i2b.015

REPORT DATE: 10-09-1991
TIME: 00:00:36

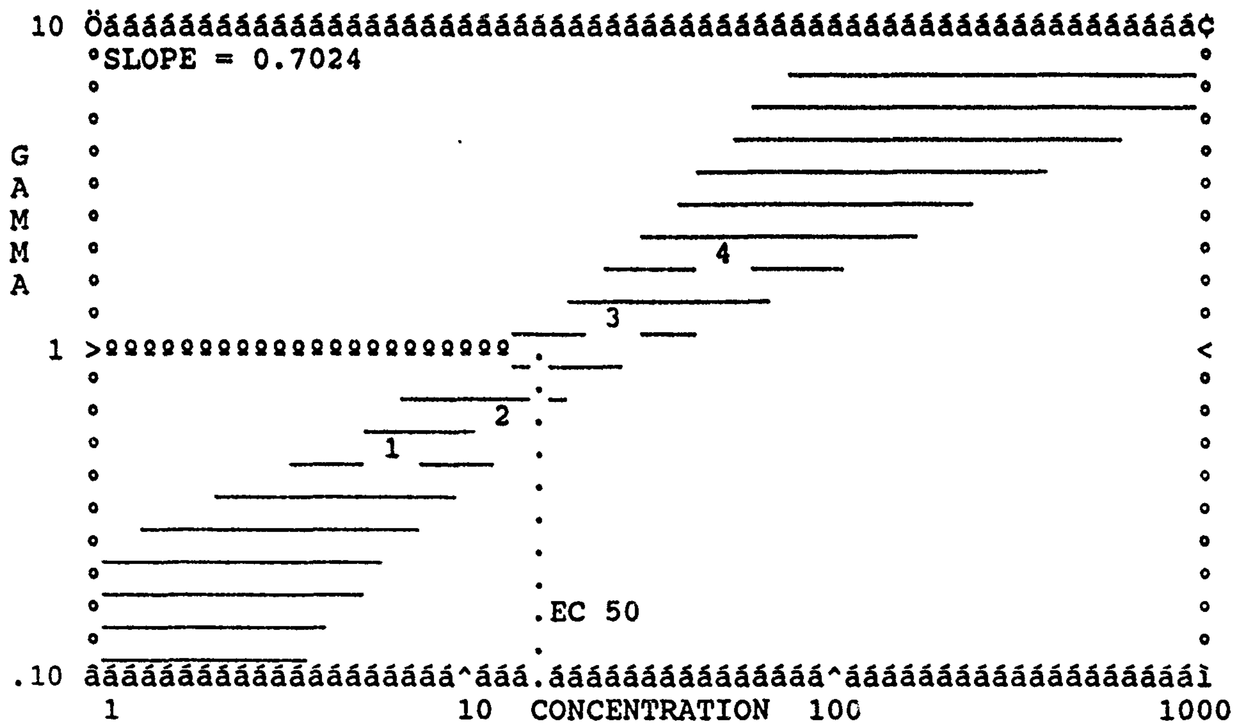
Sample Description:
Appendix I2B Sample CN91033

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	76/ 32	5.6250	0.59203
2	95/ 39	11.2500	0.63285
3	72/ 21	22.5000	1.29827
4	96/ 20	45.0000	2.21758

BLANK BO/BT = 91/ 61 BLANK RATIO = 0.6703



EC 50 = 15.50 % (95% CONFIDENCE RANGE: 8.10 TO 29.68)

TOXICITY UNITS = 6.5 (95% CONFIDENCE RANGE IS 3.4 TO 12.3)

MICROTOX DATA REPORT

FILE NAME: i3a.05

REPORT DATE: 10-09-1991
TIME: 00:00:46

Sample Description:
Appendix I3A Sample CN910336

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	75/ 59	5.6250	-0.03512*
2	74/ 58	11.2500	-0.03157*
3	85/ 70	22.5000	-0.07831*
4	98/ 78	45.0000	-0.04634*

BLANK BO/BT = 83/ 63 BLANK RATIO = 0.7590

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i3b.015

REPORT DATE: 10-09-1991
TIME: 00:00:38

Sample Description:
Appendix I3B Sample CN910336

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	75/ 51	5.6250	- .02551*
2	74/ 51	11.2500	-0.03851*
3	85/ 63	22.5000	-0.10595*
4	98/ 72	45.0000	-0.09806*

BLANK BO/BT = 83/ 55 BLANK RATIO = 0.6627

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

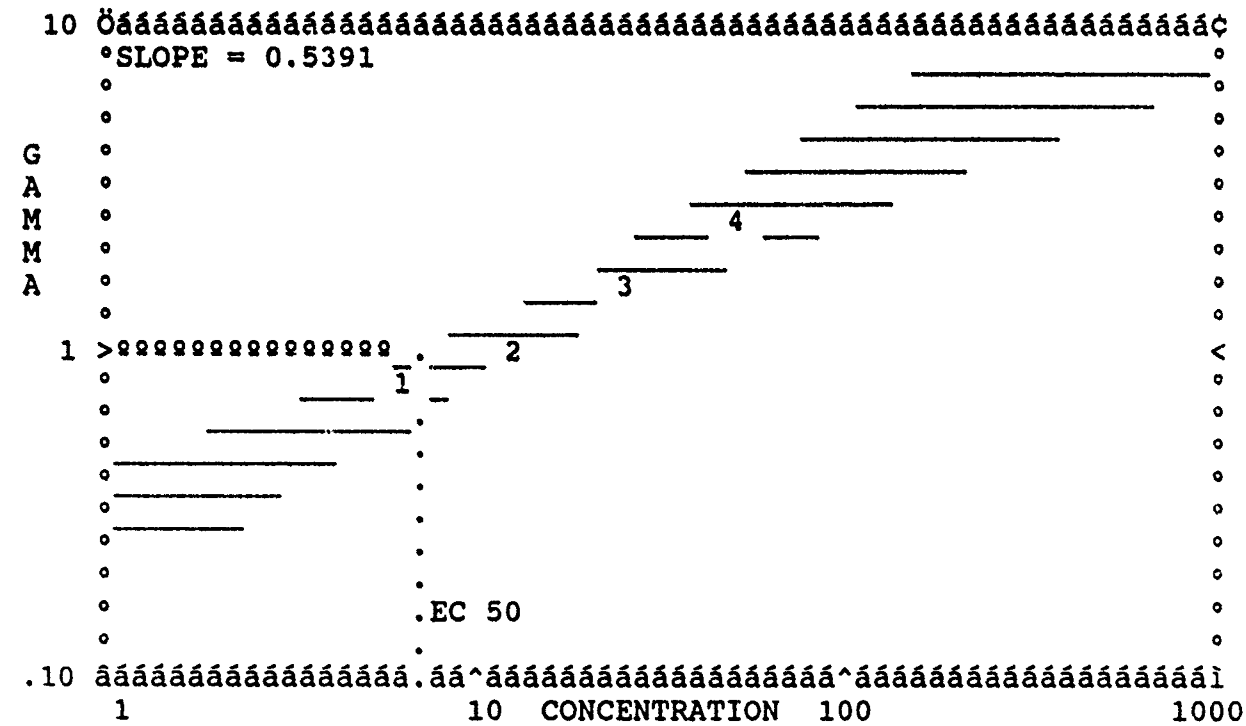
FILE NAME: i4a.05 REPORT DATE: 10-09-1991
TIME: 00:00:48

Sample Description:
Appendix I4A Sample CN910375

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	77/ 31	5.6250	0.95161
2	76/ 27	11.2500	1.21164
3	84/ 24	22.5000	1.75000
4	84/ 17	45.0000	2.88235
BLANK BO/BT =	84/ 66	BLANK RATIO = 0.7857	



EC 50 = 7.10 % (95% CONFIDENCE RANGE: 4.19 TO 12.04)

TOXICITY UNITS = 14.1 (95% CONFIDENCE RANGE IS 8.3 TO 23.9)

MICROTOX DATA REPORT

FILE NAME: i4b.015

REPORT DATE: 10-09-1991
TIME: 00:00:59

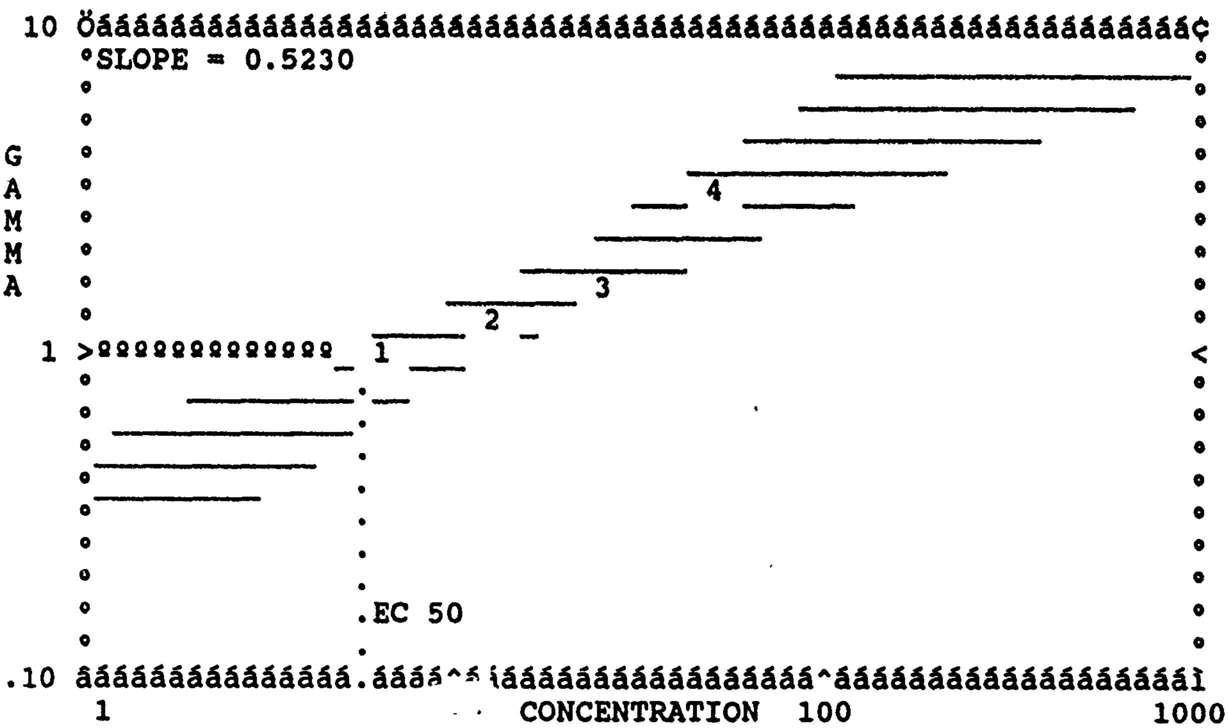
Sample Description:
Appendix I4B Sample CN910375

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	77/ 24	5.6250	1.10069
2	76/ 21	11.2500	1.36961
3	84/ 19	22.5000	1.89474
4	84/ 13	45.0000	3.23077

BLANK BO/BT = 84/ 55 BLANK RATIO = 0.6548



EC 50 = 5.62 % (95% CONFIDENCE RANGE: 2.56 TO 12.32)

TOXICITY UNITS = 17.8 (95% CONFIDENCE RANGE IS 8.1 TO 39.1)

MICROTOX DATA REPORT

FILE NAME: i5a.05

REPORT DATE: 10-09-1991
TIME: 00:00:38

Sample Description:
Appendix I5A sample CN910378

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	96/ 70	5.6250	0.05494
2	105/ 84	11.2500	-0.03846*
3	93/ 73	22.5000	-0.02002*
4	118/107	45.0000	-0.15169*

BLANK BO/BT = 91/ 70 BLANK RATIO = 0.7692

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: I5b.015

REPORT DATE: 10-09-1991
TIME: 00:02:40

Sample Description:
Appendix I5B Sample CN910378

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	96/ 61	5.6250	0.08953
2	105/ 74	11.2500	-0.01767*
3	93/ 65	22.5000	-0.00947*
4	118/ 96	45.0000	-0.14904*

BLANK BO/BT = 91/ 63 BLANK RATIO = 0.6923

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i6a.05

REPORT DATE: 10-09-1991
TIME: 00:00:30

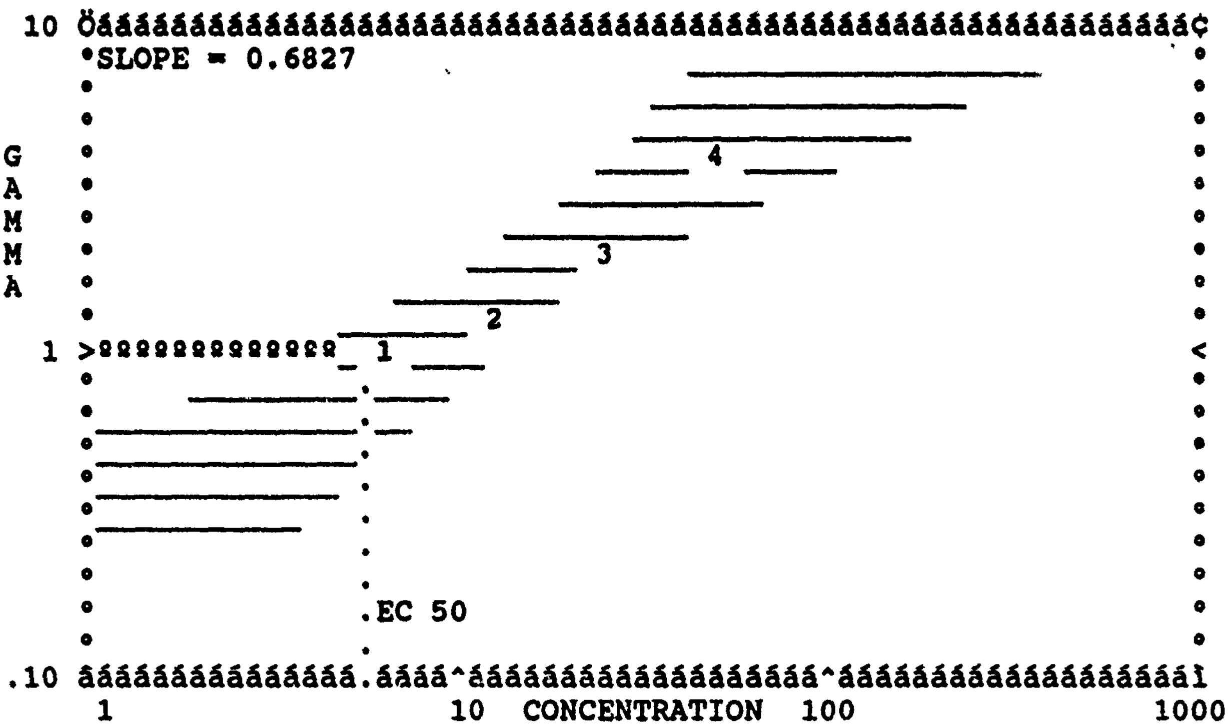
Sample Description:
Appendix I6A Sample CN910416

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	65/ 26	5.6250	1.25309
2	74/ 28	11.2500	1.38183
3	79/ 21	22.5000	2.39036
4	70/ 11	45.0000	4.73513

BLANK BO/BT = 81/ 73 BLANK RATIO = 0.9012



EC 50 = 5.60 % (95% CONFIDENCE RANGE: 1.76 TO 17.82)

TOXICITY UNITS = 17.9 (95% CONFIDENCE RANGE IS 5.6 TO 56.9)

MICROTOX DATA REPORT

FILE NAME: i6b.015

REPORT DATE: 10-09-1991
TIME: 00:00:46

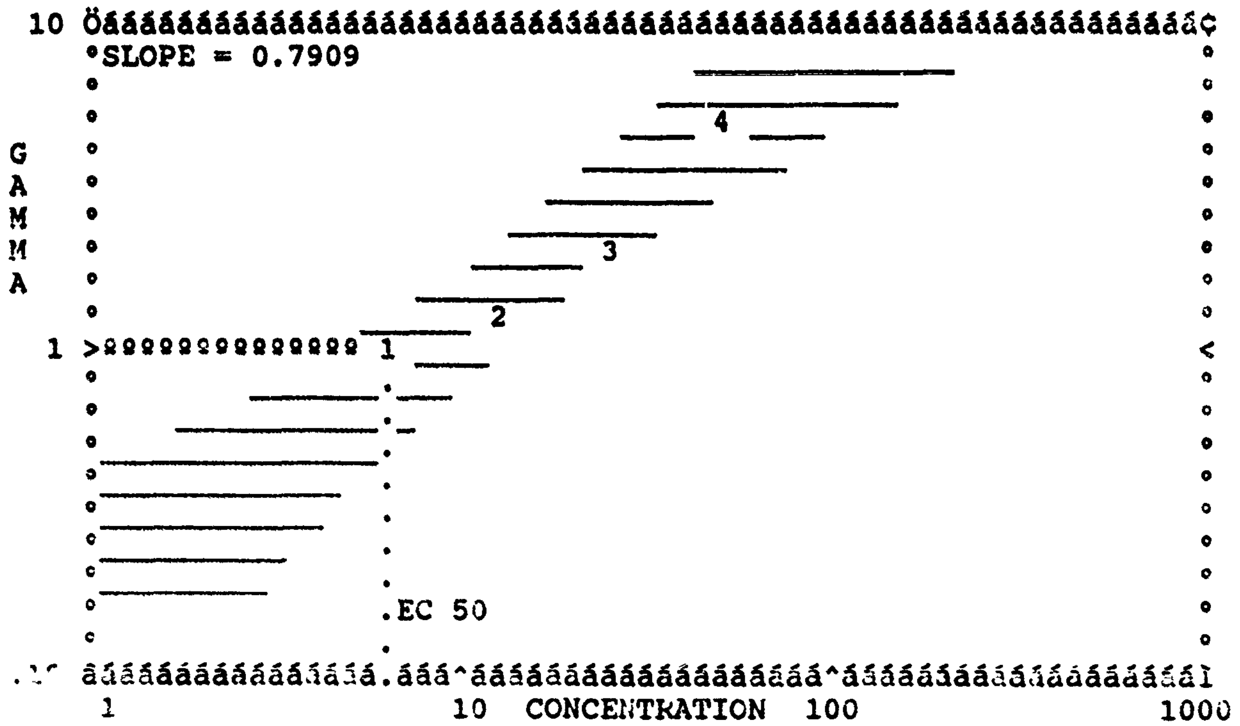
Sample Description:
Appendix I6B Sample GM910416

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	65/ 20	5.6250	1.12654
2	74/ 20	11.2500	1.42099
3	79/ 15	22.5000	2.44609
4	70/ 7	45.0000	5.54321

BLANK BO/BT = 81/ 53 BLANK RATIO = 0.6543



EC 50 = 6.19 % (95% CONFIDENCE RANGE: 2.50 TO 15.29)

TOXICITY UNITS = 16.2 (95% CONFIDENCE RANGE IS 6.5 TO 39.9)

MICROTOX DATA REPORT

FILE NAME: i7a.05

REPORT DATE: 10-09-1991
TIME: 00:00:46

Sample Description:
Appendix I7A Sample CN910419

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: MOAS
Dilution Factor : 2
Concentration Units. %

DIL.#	IO/IT	CONC.	GAMMA
1	94/ 75	5.6250	-0.05631*
2	95/ 75	11.2500	-0.04627*
3	88/ 73	22.5000	-0.09234*
4	86/ 69	45.0000	-0.06155*

BLANK BO/BT = 85/ 64   BLANK RATIO = 0.7529

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: I7b.015

REPORT DATE: 10-09-1991
TIME: 00:00:33

Sample Description:
Appendix I7B Sample CN910419

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	94/ 63	5.6250	-0.05210*
2	95/ 54	11.2500	0.11765
3	88/ 62	22.5000	-0.09829*
4	86/ 61	45.0000	-0.10434*

BLANK BO/BT = 85/ 54   BLANK RATIO = 0.6353

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i8a.05

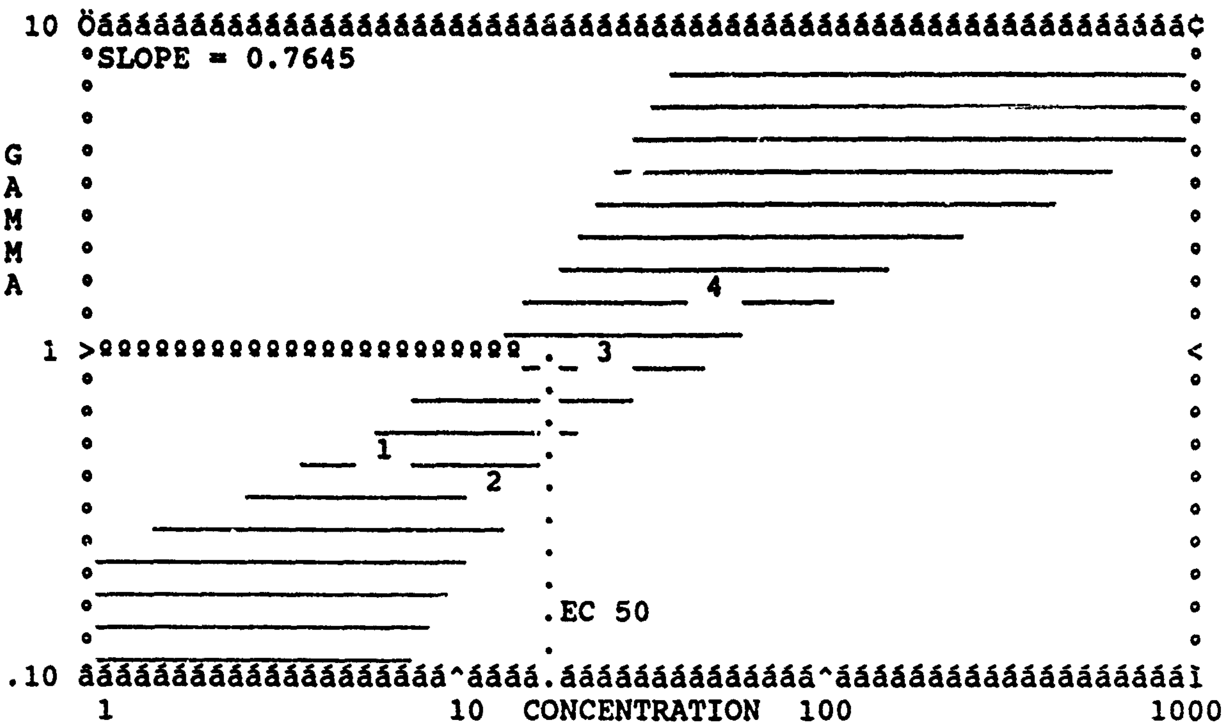
REPORT DATE: 10-09-1991
TIME: 00:00:42

Sample Description:
Appendix I8A Sample CN910425

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	97/ 50	5.6250	0.55200
2	102/ 56	11.2500	0.45714
3	99/ 36	22.5000	1.20000
4	97/ 26	45.0000	1.98462
BLANK BO/BT =	100/ 80	BLANK RATIO = 0.8000	



EC 50 = 18.50 % (95% CONFIDENCE RANGE: 6.69 TO 51.20)

TOXICITY UNITS = 5.4 (95% CONFIDENCE RANGE IS 2.0 TO 15.0)

MICROTOX DATA REPORT

FILE NAME: i8b.015

REPORT DATE: 10-09-1991
TIME: 00:00:48

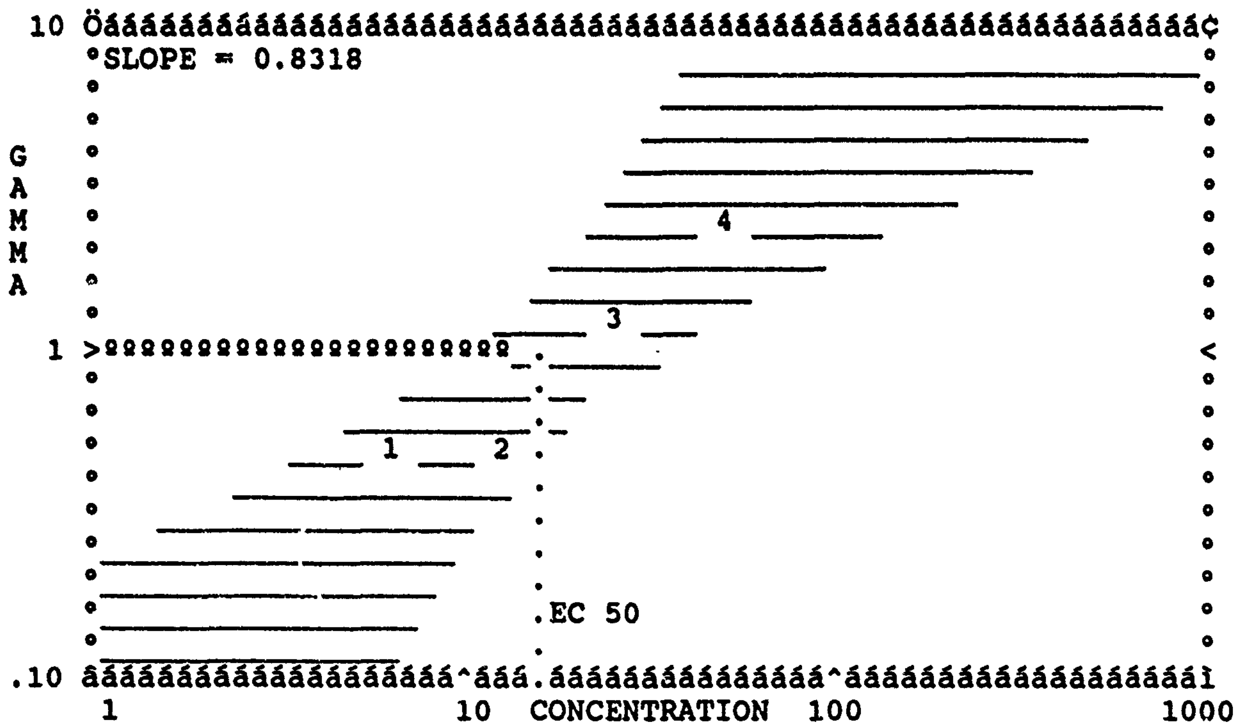
Sample Description:
Appendix I8B Sample CN910425

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	97/ 40	5.6250	0.60050
2	102/ 44	11.2500	0.53000
3	99/ 27	22.5000	1.42000
4	97/ 18	45.0000	2.55667

BLANK BO/BT = 100/ 66   BLANK RATIO = 0.6600



EC 50 = 15.28 % (95% CONFIDENCE RANGE: 6.22 TO 37.55)

TOXICITY UNITS = 6.5 (95% CONFIDENCE RANGE IS 2.7 TO 16.1)

MICROTOX DATA REPORT

FILE NAME: I9b.015

REPORT DATE: 10-09-1991
TIME: 00:00:47

Sample Description:
Appendix I9B Sample CN910431

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	88/ 55	5.6250	0.10345
2	79/ 57	11.2500	-0.04416*
3	77/ 51	22.5000	0.04124
4	87/ 61	45.0000	-0.01639*

BLANK BO/BT = 87/ 60 BLANK RATIO = 0.6897

RECOMMEND: PERFORM 100% ASSAY ON THIS SAMPLE

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i9a.05

REPORT DATE: 10-09-1991
TIME: 00:00:50

Sample Description:
Appendix I9A Sample CN910431

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	88/ 64	5.6250	0.07471
2	79/ 64	11.2500	-0.03520*
3	77/ 59	22.5000	0.02007
4	87/ 69	45.0000	-0.01449*

BLANK BO/BT = 87/ 68 BLANK RATIO = 0.7816

RECOMMEND: PERFORM 100% ASSAY ON THIS SAMPLE

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i10a.05

REPORT DATE: 10-16-1991
TIME: 00:01:27

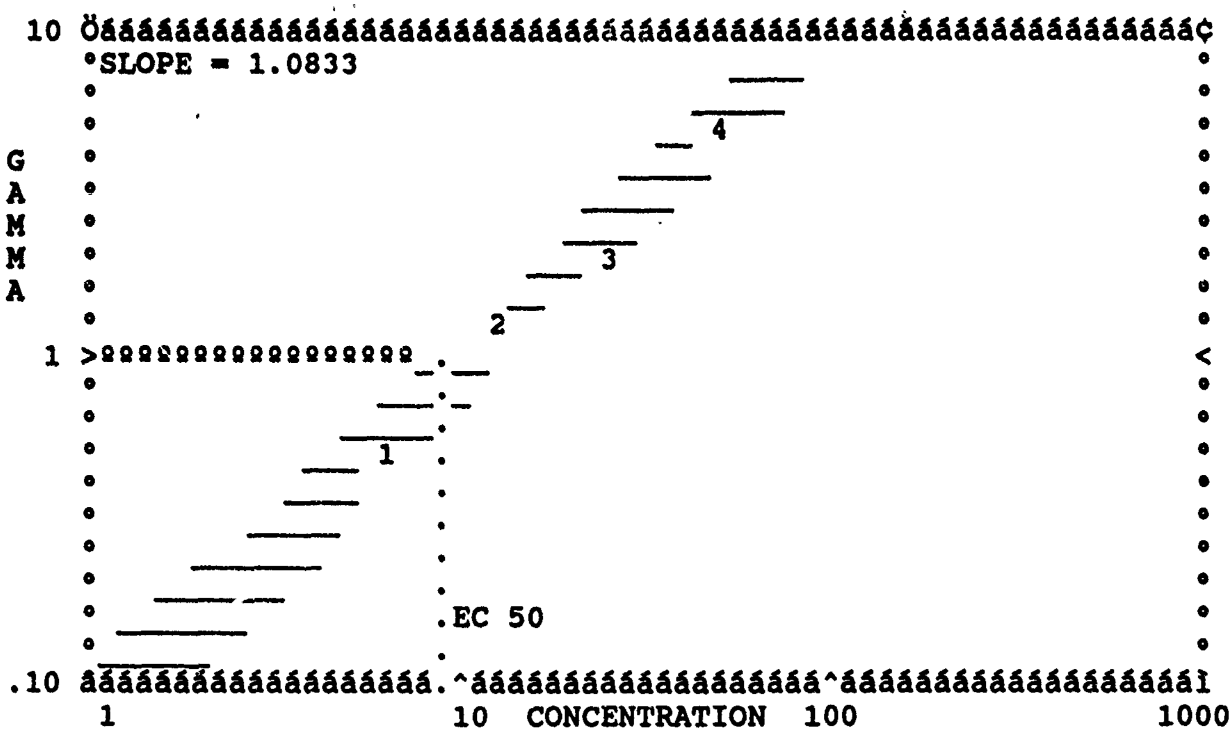
Sample Description:
"Appendix I10A Sample CN910444"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	93/ 45	5.6250	0.54432
2	92/ 29	11.2500	1.37060
3	96/ 21	22.5000	2.41601
4	95/ 11	45.0000	5.45355

BLANK B0/BT = 91/ 68 BLANK RATIO = 0.7473



EC 50 = 9.41 % (95% CONFIDENCE RANGE: 7.35 TO 12.05)

TOXICITY UNITS = 10.6 (95% CONFIDENCE RANGE IS 8.3 TO 13.6)

MICROTOX DATA REPORT

FILE NAME: i10b.015

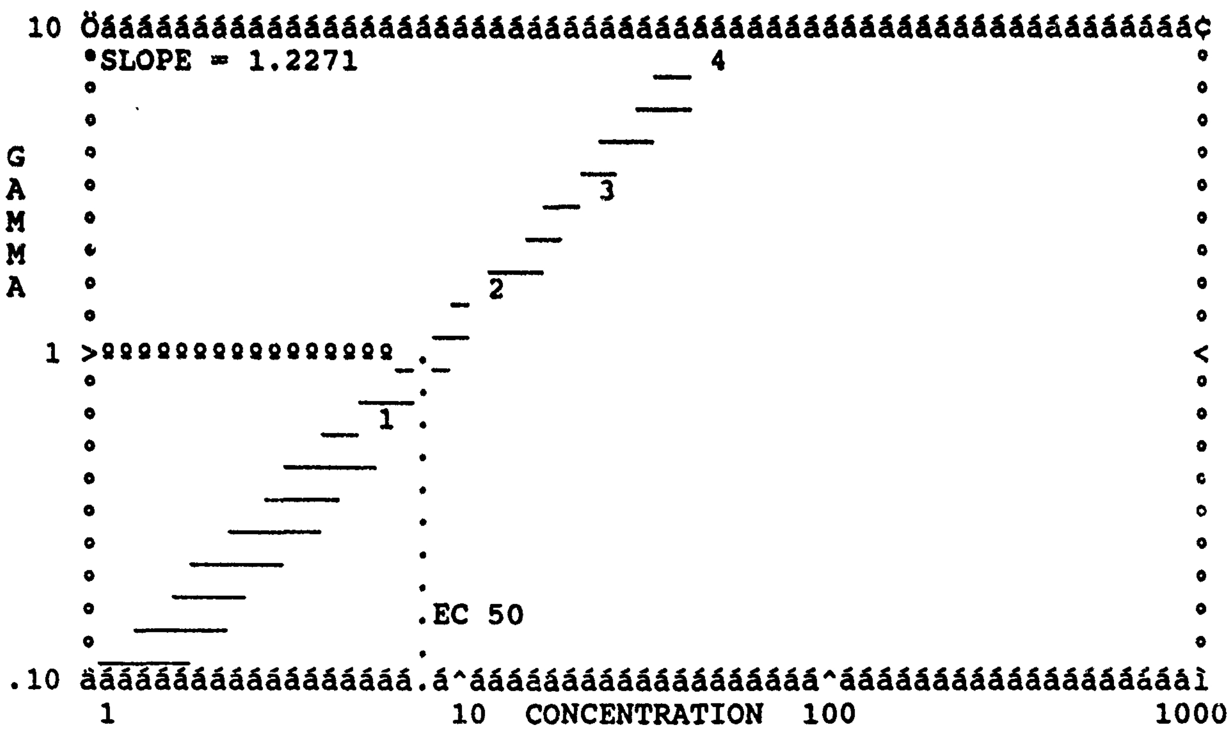
REPORT DATE: 10-16-1991
TIME: 00:01:15

Sample Description:
"Appendix I10B Sample CN910444"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	93/ 34	5.6250	0.65320
2	92/ 20	11.2500	1.78022
3	96/ 12	22.5000	3.83517
4	95/ 6	45.0000	8.56960
BLANK BO/BT =	91/ 55	BLANK RATIO = 0.6044	



EC 50 = 7.58 % (95% CONFIDENCE RANGE: 6.21 TO 9.26)

TOXICITY UNITS = 13.2 (95% CONFIDENCE RANGE IS 10.8 TO 16.1)

MICROTOX DATA REPORT

FILE NAME: i10A.05

REPORT DATE: 10-09-1991
TIME: 00:02:46

Sample Description:
"Appendix I10A Sample CN910452"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 54	5.6250	0.03571
2	88/ 65	11.2500	-0.06520*
3	45/ 38	22.5000	-0.18233*
4	79/ 0	45.0000	> 99 *

BLANK BO/BT = 84/ 58 BLANK RATIO = 0.6905

RECOMMEND: PERFORM 100% ASSAY ON THIS SAMPLE

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i10b.015

REPORT DATE: 10-09-1991
TIME: 00:01:39

Sample Description:
"Appendix I10B Sample CN910452"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 49	5.6250	-0.07507*
2	88/ 52	11.2500	-0.05311*
3	45/ 32	22.5000	-0.21317*
4	79/ 50	45.0000	-0.11595*

BLANK BO/BT = 84/ 47 BLANK RATIO = 0.5595

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i11a.05 REPORT DATE: 10-10-1991
TIME: 00:01:51

Sample Description:
"Appendix I11A Sample CN91052"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 54	5.6250	0.03571
2	88/ 65	11.2500	-0.06520*
3	45/ 38	22.5000	-0.18233*
4	79/ 60	45.0000	-0.09087*

BLANK BO/BT = 84/ 58 BLANK RATIO = 0.6905

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i11b.015 REPORT DATE: 10-10-1991
TIME: 00:02:07

Sample Description:
"Appendix I11B Sample CN910452"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 49	5.6250	-0.07507*
2	88/ 52	11.2500	-0.05311*
3	45/ 32	22.5000	-0.21317*
4	79/ 50	45.0000	-0.11595*

BLANK BO/BT = 84/ 47 BLANK RATIO = 0.5595

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i12a.05

REPORT DATE: 10-10-1991
TIME: 00:02:25

Sample Description:
"Appendix I12A Sample CN910449"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	80/ 61	5.6250	-0.05916*
2	95/ 70	11.2500	-0.02640*
3	121/ 70	22.5000	0.24006
4	106/ 71	45.0000	0.07103
BLANK BO/BT =	92/ 66	BLANK RATIO = 0.7174	

RECOMMEND: PERFORM 100% ASSAY ON THIS SAMPLE

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i12b.015

REPORT DATE: 10-10-1991
TIME: 00:02:57

Sample Description:
"Appendix I12B Sample CN910499"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	80/ 51	5.6250	-0.04518*
2	95/ 60	11.2500	-0.03623*
3	121/ 61	22.5000	0.20741
4	106/ 62	45.0000	0.04067
BLANK BO/BT =	92/ 56	BLANK RATIO = 0.6087	

RECOMMEND: PERFORM 100% ASSAY ON THIS SAMPLE

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i13a.05

REPORT DATE: 10-10-1991
TIME: 00:02:36

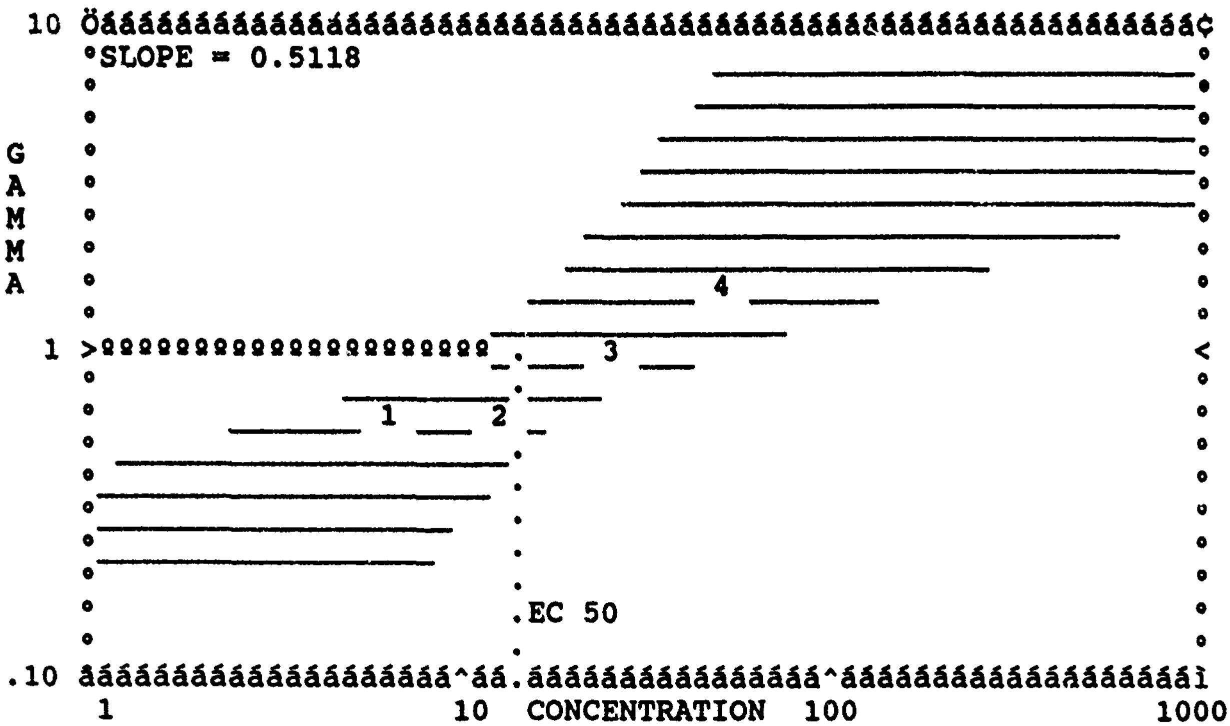
Sample Description:
"Appendix I13A Sample CN910502"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	91/ 34	5.6250	0.79298
2	93/ 37	11.2500	0.68381
3	104/ 32	22.5000	1.17718
4	91/ 21	45.0000	1.90291

BLANK BO/BT = 103/ 69 BLANK RATIO = 0.6699



EC 50 = 14.62 % (95% CONFIDENCE RANGE: 5.02 TO 42.52)

TOXICITY UNITS = 6.8 (95% CONFIDENCE RANGE IS 2.4 TO 19.9)

MICROTOX DATA REPORT

FILE NAME: i13b.015

REPORT DATE: 10-10-1991
TIME: 00:02:06

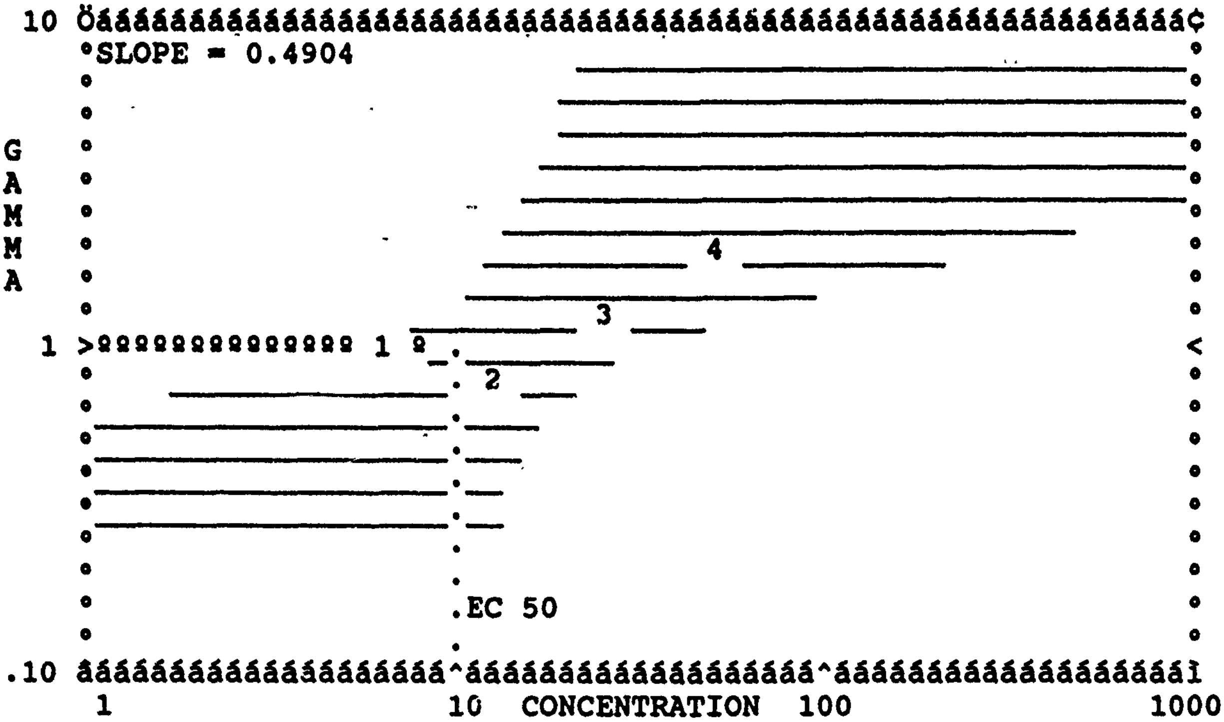
Sample Description:
"Appendix I13B Sample CN910502"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	91/ 26	5.6250	1.10680
2	93/ 30	11.2500	0.86602
3	104/ 27	22.5000	1.31859
4	91/ 16	45.0000	2.42354

BLANK BO/BT = 103/ 62   BLANK RATIO = 0.6019



EC 50 = 9.99 % (95% CONFIDENCE RANGE: 1.83 TO 54.44)

TOXICITY UNITS = 10.0 (95% CONFIDENCE RANGE IS 1.8 TO 54.5)

MICROTOX DATA REPORT

FILE NAME: i14a.05

REPORT DATE: 10-10-1991
TIME: 00:01:35

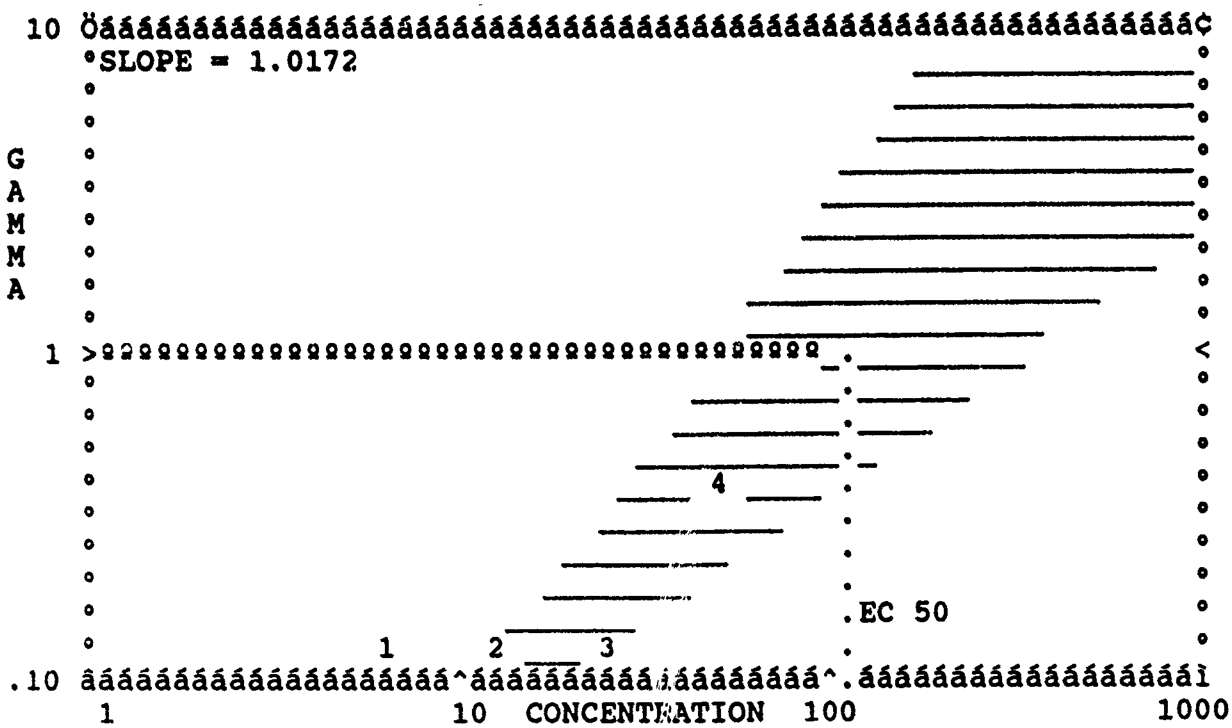
Sample Description:
"Appendix I14A Sample CN910506"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	99/ 67	5.6250	0.05544
2	104/ 68	11.2500	0.09244
3	96/ 60	22.5000	0.14286
4	111/ 54	45.0000	0.46825

BLANK BO/BT = 105/ 75   BLANK RATIO = 0.7143



EC 50 IS GREATER THAN 100%

MICROTOX DATA REPORT

FILE NAME: i14b.015

REPORT DATE: 10-10-1991
TIME: 00:01:34

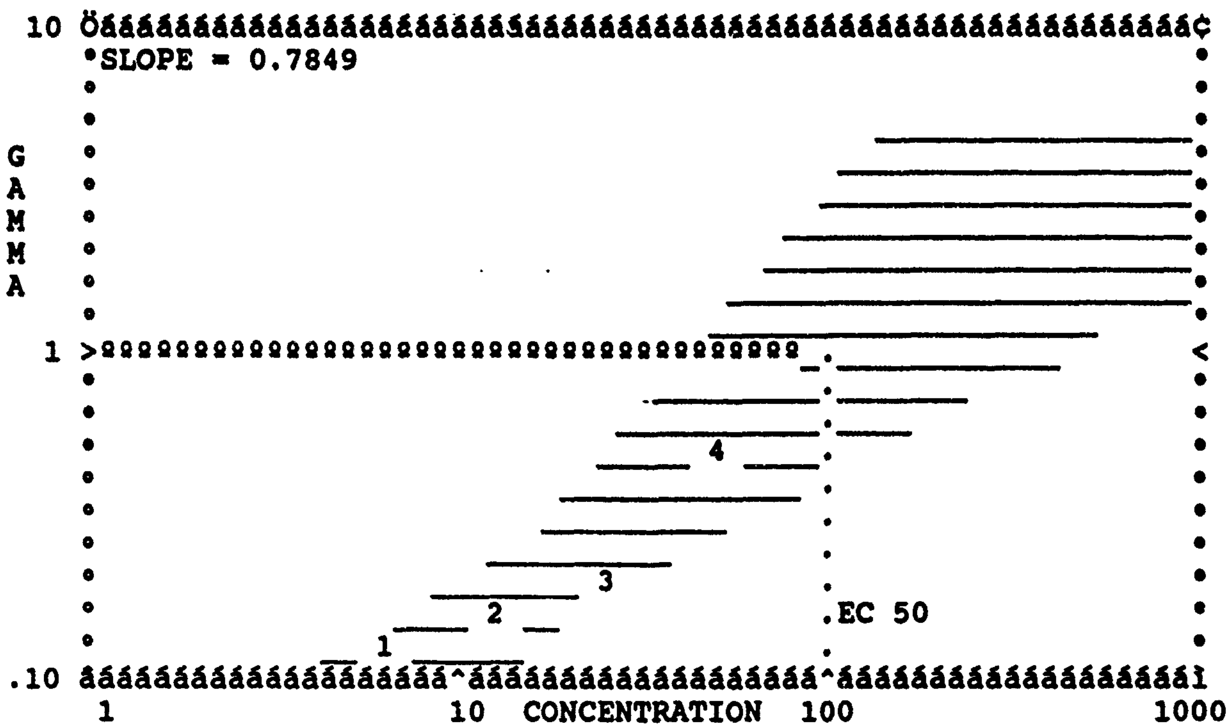
Sample Description:
"Appendix I14B Sample CN910506"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	99/ 52	5.6250	0.10604
2	104/ 51	11.2500	0.18469
3	96/ 46	22.5000	0.21242
4	111/ 41	45.0000	0.57282

BLANK BO/BT = 105/ 61 BLANK RATIO = 0.5810



EC 50 IS GREATER THAN 100%

MICROTOX DATA REPORT

FILE NAME: i15a.05

REPORT DATE: 10-10-1991
TIME: 00:02:23

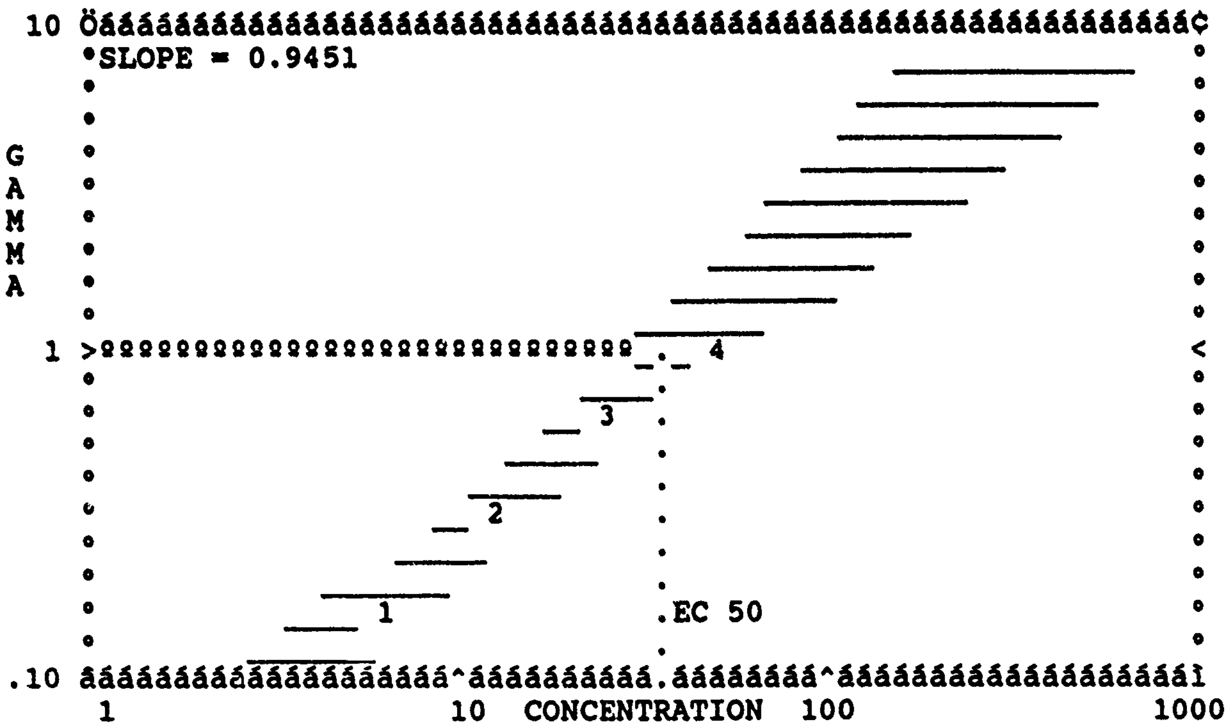
Sample Description:
"Appendix I15A Sample CN910495"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	76/ 44	5.6250	0.16445
2	68/ 33	11.2500	0.38917
3	72/ 28	22.5000	0.73355
4	96/ 30	45.0000	1.15730

BLANK BO/BT = 89/ 60 BLANK RATIO = 0.6742



EC 50 = 34.12 % (95% CONFIDENCE RANGE: 21.52 TO 54.10)

TOXICITY UNITS = 2.9 (95% CONFIDENCE RANGE IS 1.8 TO 4.6)

MICROTOX DATA REPORT

FILE NAME: i15b.015

REPORT DATE: 10-10-1991
TIME: 00:01:29

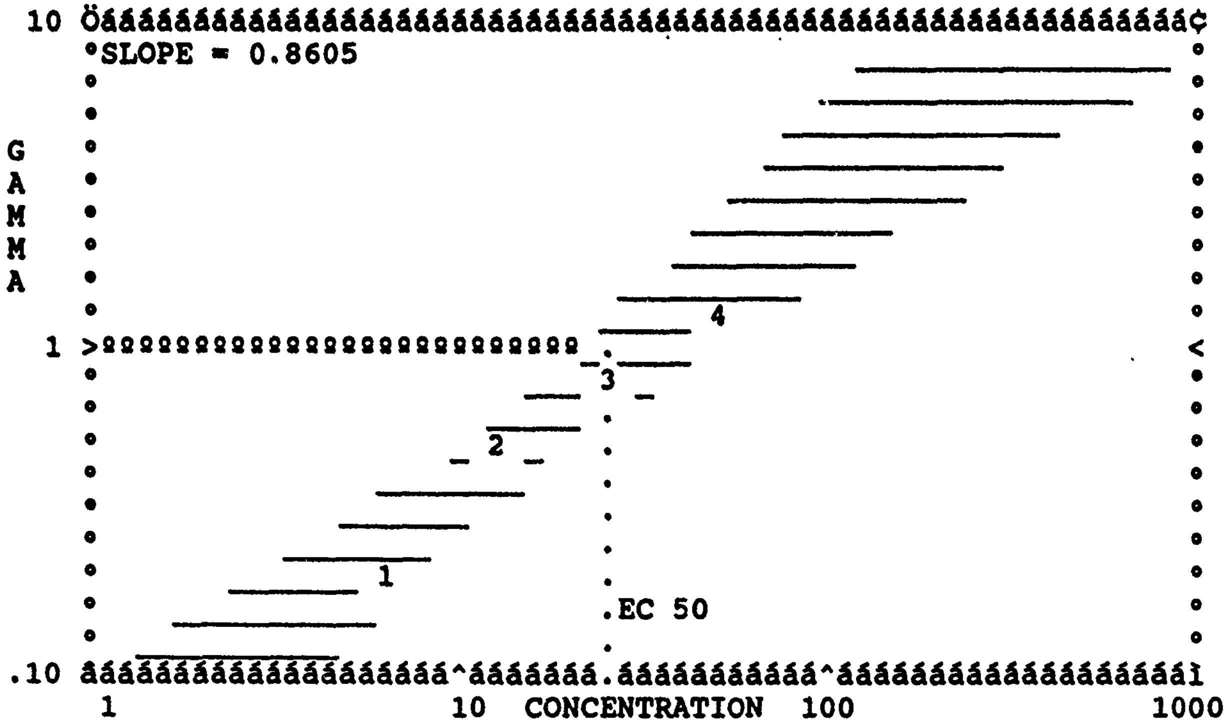
Sample Description:
"Appendix I15B Sample CN910495"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	76/ 33	5.6250	0.24208
2	68/ 23	11.2500	0.59453
3	72/ 20	22.5000	0.94157
4	96/ 21	45.0000	1.46549

BLANK B0/BT = 89/ 48 BLANK RATIO = 0.5393



EC 50 = 25.24 % (95% CONFIDENCE RANGE: 15.16 TO 42.04)

TOXICITY UNITS = 4.0 (95% CONFIDENCE RANGE IS 2.4 TO 6.6)

MICROTOX DATA REPORT

FILE NAME: i16a.05

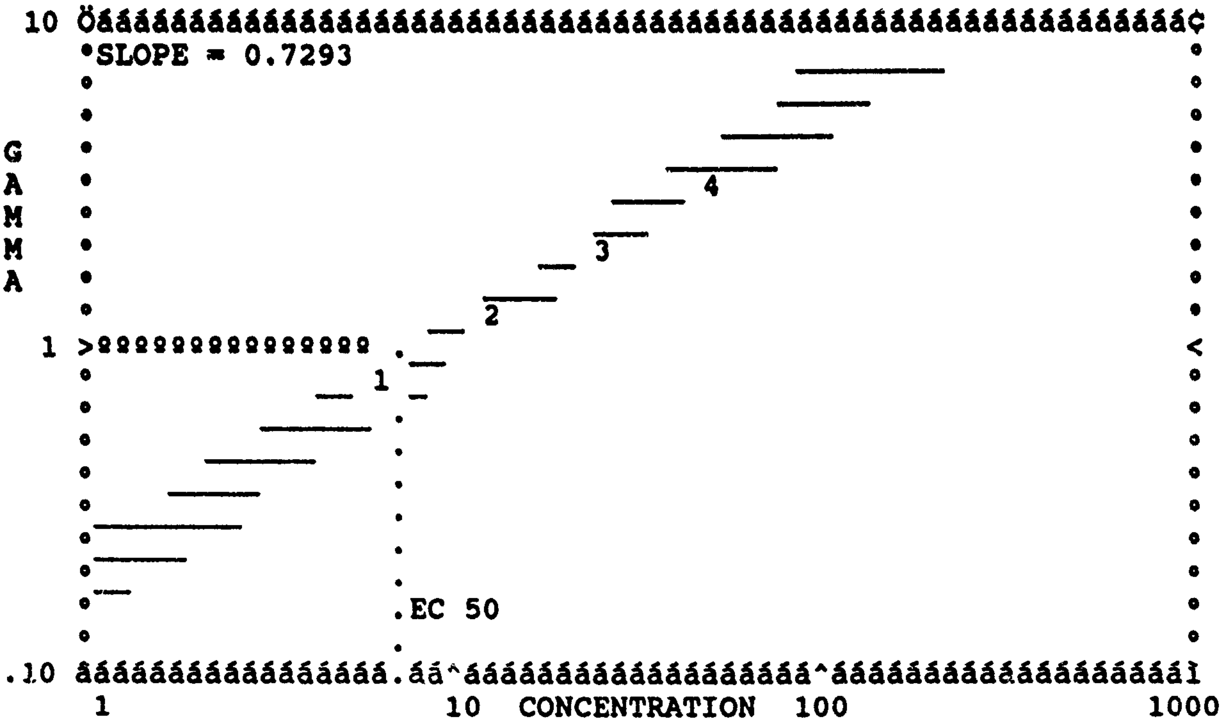
REPORT DATE: 10-10-1991
TIME: 00:01:51

Sample Description:
"Appendix I16A Sample CN910466"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moa
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	103/ 43	5.6250	0.87817
2	101/ 34	11.2500	1.32921
3	99/ 24	22.5000	2.23438
4	95/ 15	45.0000	3.96591
BLANK BO/BT =	88/ 69	BLANK RATIO = 0.7841	



EC 50 = 7.16 % (95% CONFIDENCE RANGE: 5.62 TO 9.11)

TOXICITY UNITS = 14.0 (95% CONFIDENCE RANGE IS 11.0 TO 17.8)

MICROTOX DATA REPORT

FILE NAME: i16b.015

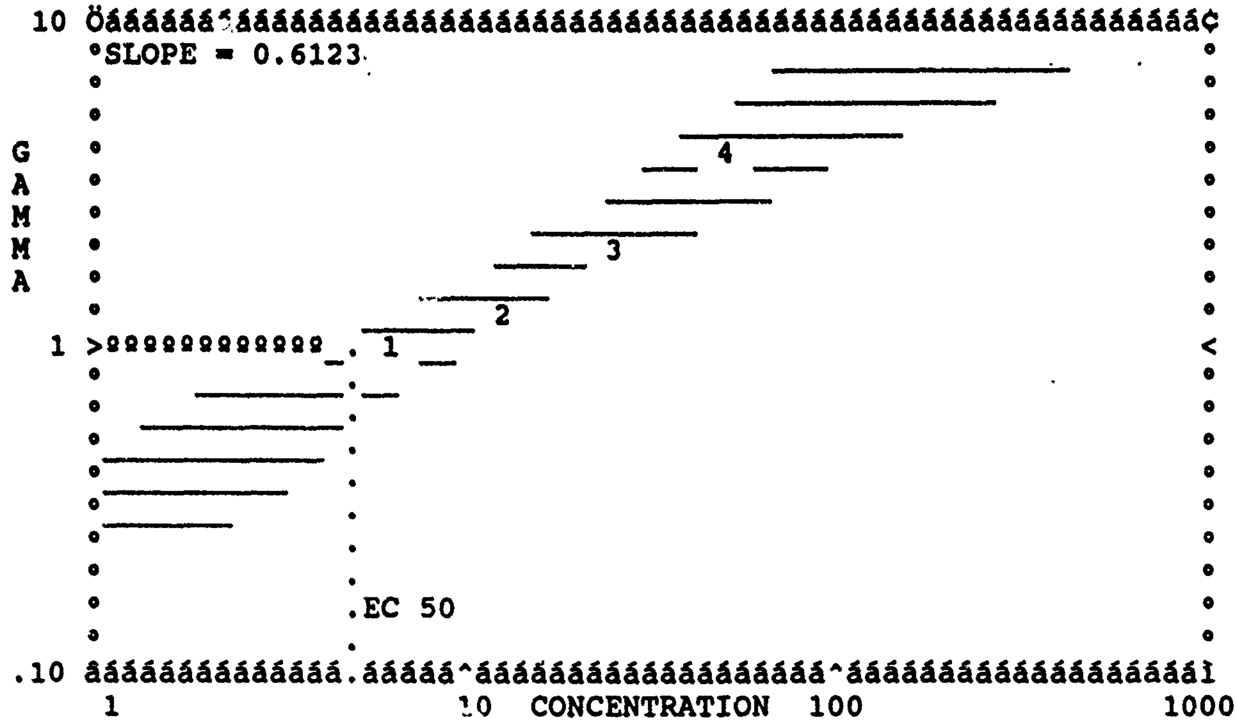
REPORT DATE: 10-10-1991
TIME: 00:01:35

Sample Description:
"Appendix I16B Sample CN910466"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	103/ 31	5.6250	1.18988
2	101/ 26	11.2500	1.56031
3	99/ 20	22.5000	2.26250
4	95/ 12	45.0000	4.21780
BLANK BO/BT =	88/ 58	BLANK RATIO = 0.6591	



EC 50 = 5.02 % (95% CONFIDENCE RANGE: 2.24 TO 11.27)

TOXICITY UNITS = 19.9 (95% CONFIDENCE RANGE IS 8.9 TO 44.6)

MICROTOX DATA REPORT

FILE NAME: i17a.05

REPORT DATE: 10-10-1991
TIME: 00:01:27

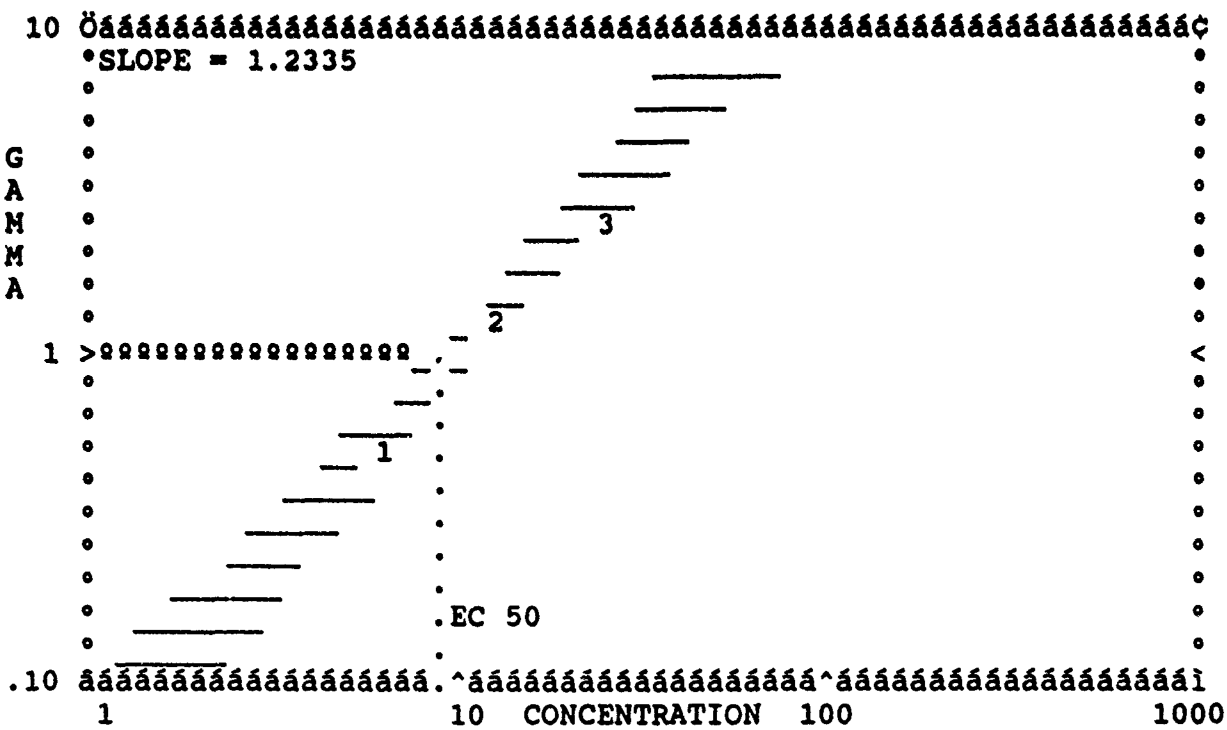
Sample Description:
"Appendix I17A Sample CN910488"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	85/ 39	5.6250	0.56727
2	96/ 29	11.2500	1.38047
3	92/ 16	22.5000	3.13483
4	95/ 5	45.0000	12.66292*

BLANK BO/BT = 89/ 64 BLANK RATIO = 0.7191



EC 50 = 8.83 % (95% CONFIDENCE RANGE: 7.35 TO 10.60)

TOXICITY UNITS = 11.3 (95% CONFIDENCE RANGE IS 9.4 TO 13.6)

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i17b.015

REPORT DATE: 10-10-1991
TIME: 00:01:11

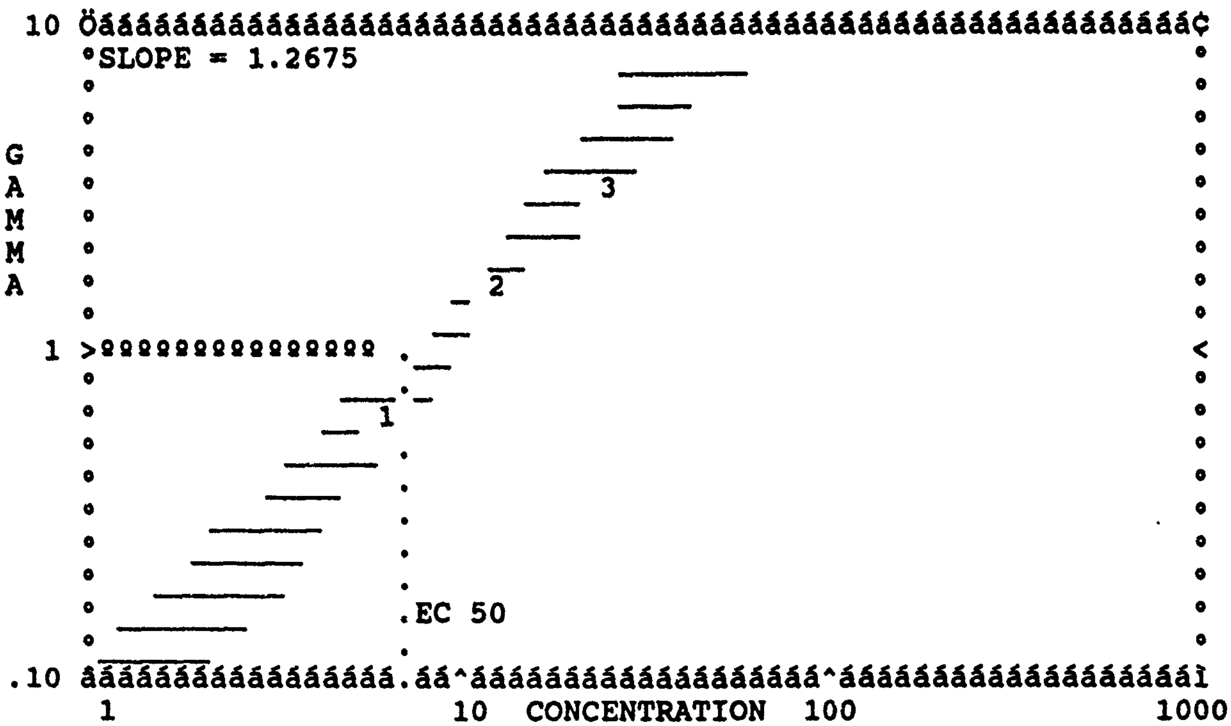
Sample Description:
"Appendix I17B Sample CN910488"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	85/ 30	5.6250	0.68727
2	96/ 21	11.2500	1.72231
3	92/ 11	22.5000	3.98059
4	95/ 3	45.0000	17.85768*

BLANK BO/BT = 89/ 53 BLANK RATIO = 0.5955



EC 50 = 7.48 % (95% CONFIDENCE RANGE: 5.91 TO 9.47)

TOXICITY UNITS = 13.4 (95% CONFIDENCE RANGE IS 10.6 TO 16.9)

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i18a.05

REPORT DATE: 10-10-1991
TIME: 00:01:19

Sample Description:
"Appendix I18A Sample CN910503"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	88/ 71	5.6250	-0.03439*
2	87/ 73	11.2500	-0.07152*
3	91/ 75	22.5000	-0.05473*
4	92/ 77	45.0000	-0.06916*

BLANK BO/BT = 86/ 67 BLANK RATIO = 0.7791

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i18b.015

REPORT DATE: 10-10-1991
TIME: 00:01:31

Sample Description:
"Appendix I18B Sample CN910503"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 15 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	88/ 87	5.6250	-0.40016*
2	87/ 60	11.2500	-0.14012*
3	91/ 63	22.5000	-0.14341*
4	92/ 67	45.0000	-0.18570*

BLANK BO/BT = 86/ 51 BLANK RATIO = 0.5930

EC 50 IS GREATER THAN 100%

* Invalid gammas

MICROTOX DATA REPORT

FILE NAME: i19.05

REPORT DATE: 10-09-1991
TIME: 00:00:21

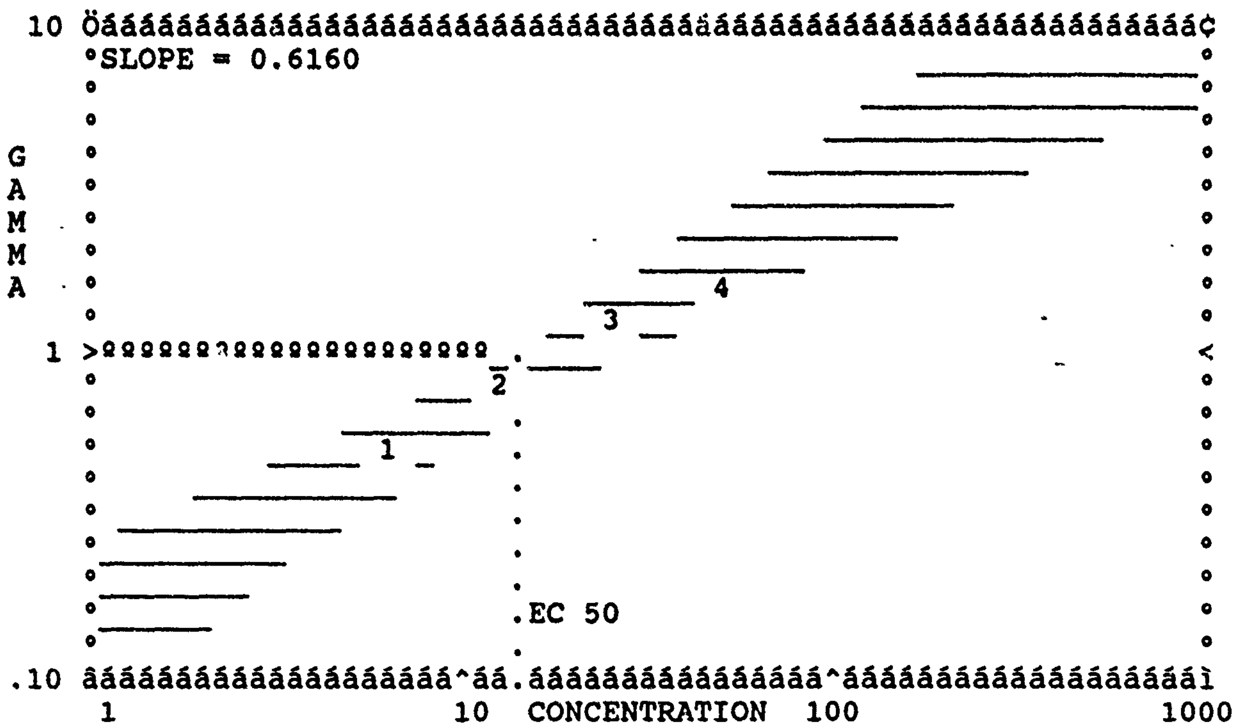
Sample Description:

"Appendix I19 pH Lowered to 3, then returned to pHi"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	83/ 45	5.6250	0.52712
2	89/ 37	11.2500	0.99157
3	93/ 33	22.5000	1.33333
4	96/ 27	45.0000	1.94385
BLANK B0/BT =	93/ 77	BLANK RATIO = 0.8280	



EC 50 = 14.09 % (95% CONFIDENCE RANGE: 9.49 TO 20.91)

TOXICITY UNITS = 7.1 (95% CONFIDENCE RANGE IS 4.8 TO 10.5)

MICROTOX DATA REPORT

FILE NAME: i20.05

REPORT DATE: 10-09-1991
TIME: 00:00:12

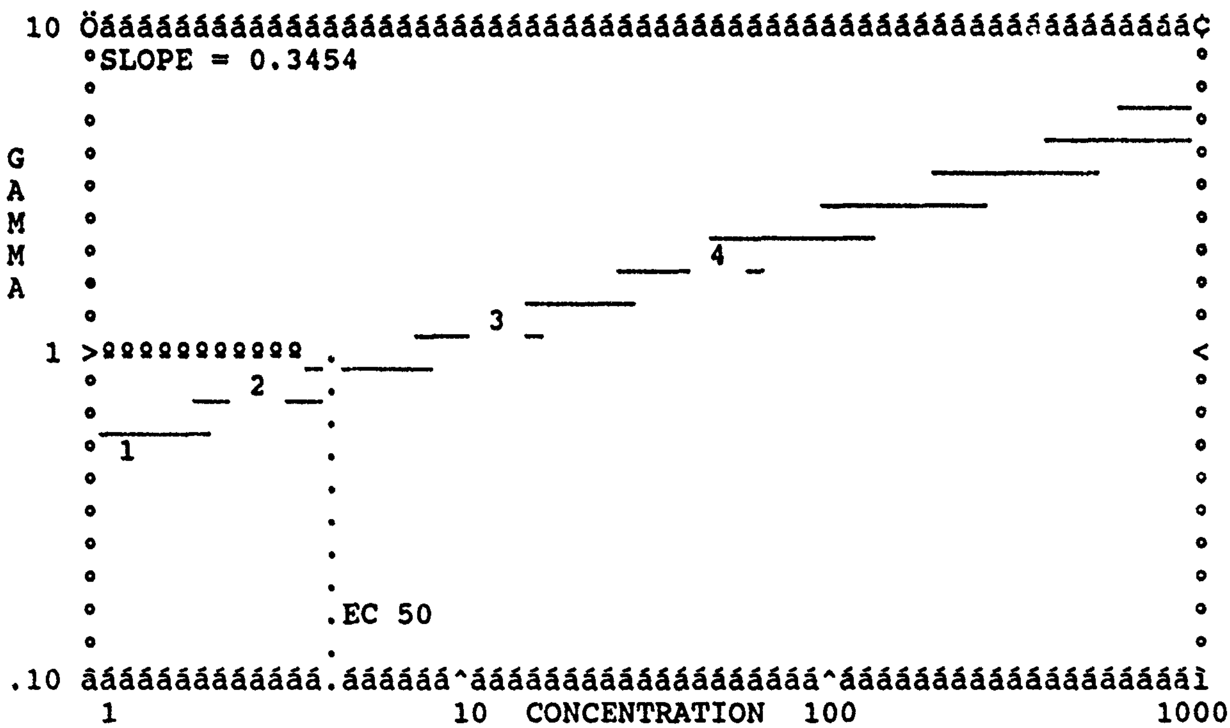
Sample Description:
"Appendix I20 pH raised to 11, lowered to pHi"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 4
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 41	0.7031	0.53165
2	82/ 34	2.8125	0.86980
3	88/ 28	11.2500	1.43660
4	83/ 20	45.0000	2.21742

BLANK BO/BT = 89/ 69 BLANK RATIO = 0.7753



EC 50 = 4.25 % (95% CONFIDENCE RANGE: 3.65 TO 4.95)

TOXICITY UNITS = 23.5 (95% CONFIDENCE RANGE IS 20.2 TO 27.4)

MICROTOX DATA REPORT

FILE NAME: i21.05

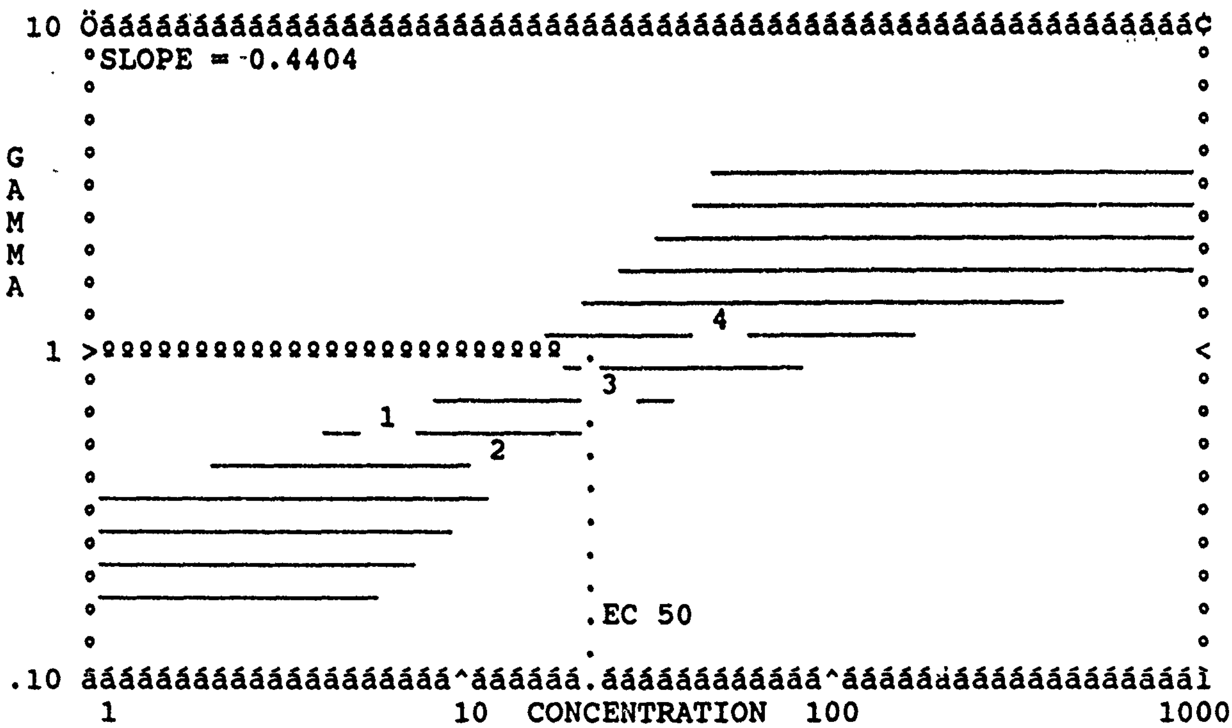
REPORT DATE: 10-09-1991
TIME: 00:00:45

Sample Description:
"Appendix I21 Oxidant Reduction on Sample CN910375"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	90/ 39	5.6250	0.64041
2	90/ 40	11.2500	0.59940
3	87/ 33	22.5000	0.87404
4	92/ 27	45.0000	1.42213
BLANK BO/BT =	83/ 59	BLANK RATIO = 0.7108	



EC 50 = 23.30 % (95% CONFIDENCE RANGE: 7.56 TO 71.78)

TOXICITY UNITS = 4.3 (95% CONFIDENCE RANGE IS 1.4 TO 13.2)

MICROTOX DATA REPORT

FILE NAME: i22.05 REPORT DATE: 10-09-1991
TIME: 00:01:34

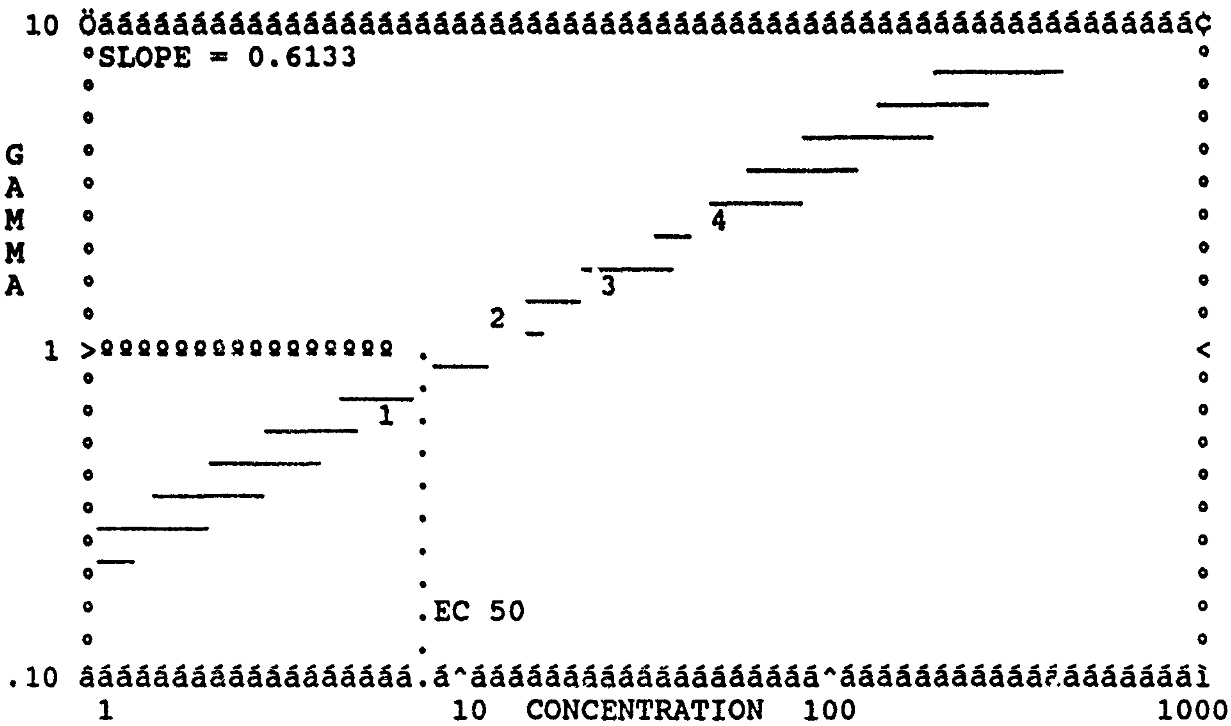
Sample Description:
"EDTA Chelation Test"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	78/ 31	5.6250	0.79274
2	86/ 27	11.2500	1.26944
3	91/ 23	22.5000	1.81902
4	82/ 15	45.0000	2.89500

BLANK BO/BT = 80/ 57 BLANK RATIO = 0.7125



EC 50 = 8.07 % (95% CONFIDENCE RANGE: 6.88 TO 9.47)

TOXICITY UNITS = 12.4 (95% CONFIDENCE RANGE IS 10.6 TO 14.5)

MICROTOX DATA REPORT

FILE NAME: i23.05

REPORT DATE: 10-09-1991
TIME: 00:02:27

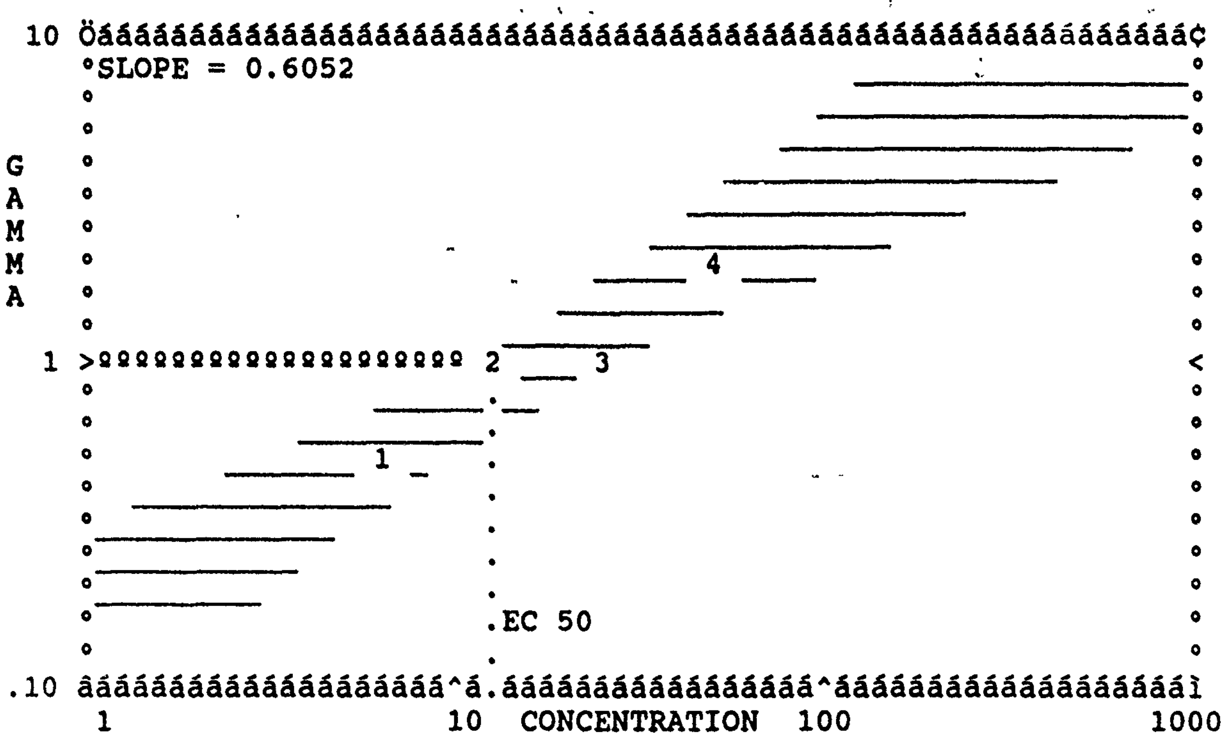
Sample Description:
"Appendix I23 pHo Filtered"

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	93/ 49	5.6250	0.59509
2	89/ 36	11.2500	1.07772
3	85/ 32	22.5000	1.23238
4	96/ 25	45.0000	2.22723

BLANK B0/BT = 94/ 79 BLANK RATIO = 0.8404



EC 50 = 12.67 % (95% CONFIDENCE RANGE: 7.39 TO 21.71)

TOXICITY UNITS = 7.9 (95% CONFIDENCE RANGE IS 4.6 TO 13.5)

MICROTOX DATA REPORT

FILE NAME: i24.05

REPORT DATE: 10-09-1991
TIME: 00:02:32

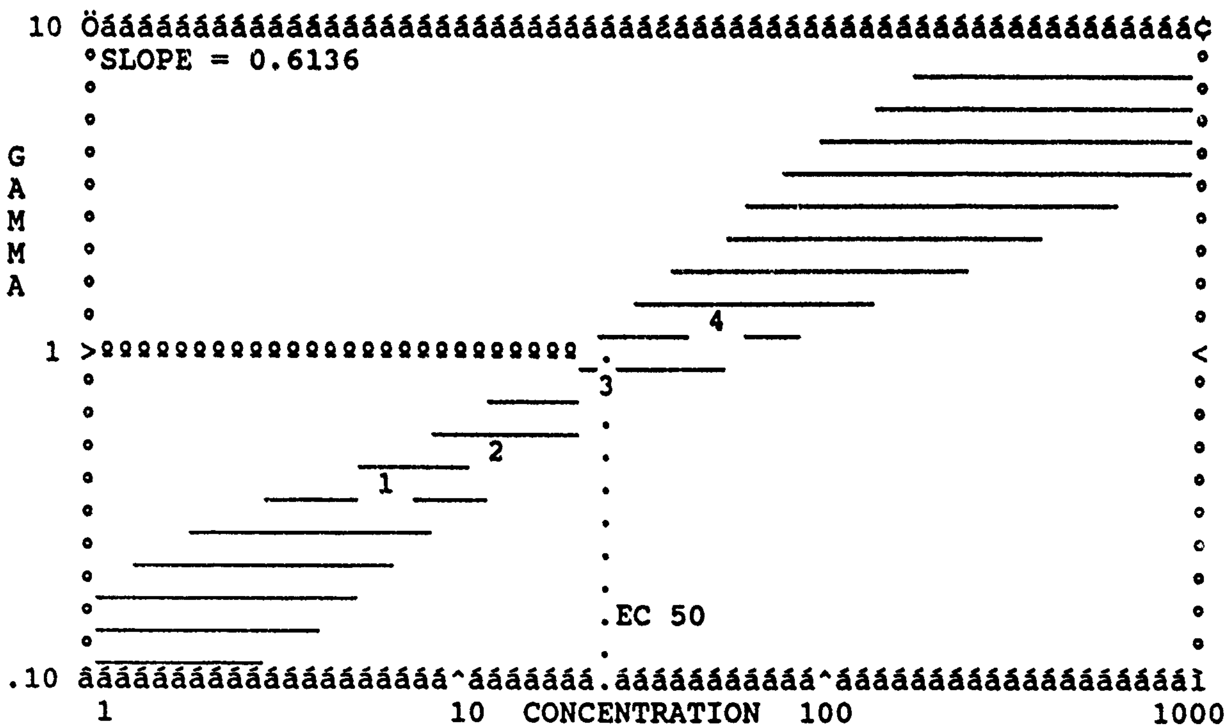
Sample Description:
Appendix 24, pH11, filtered, pHo

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	90/ 48	5.6250	0.45833
2	101/ 52	11.2500	0.51068
3	105/ 42	22.5000	0.94444
4	102/ 32	45.0000	1.47917

BLANK BO/BT = 90/ 70 BLANK RATIO = 0.7778



EC 50 = 24.76 % (95% CONFIDENCE RANGE: 12.88 TO 47.59)

TOXICITY UNITS = 4.0 (95% CONFIDENCE RANGE IS 2.1 TO 7.8)

MICROTOX DATA REPORT

FILE NAME: i25.05

REPORT DATE: 10-09-1991
TIME: 00:03:26

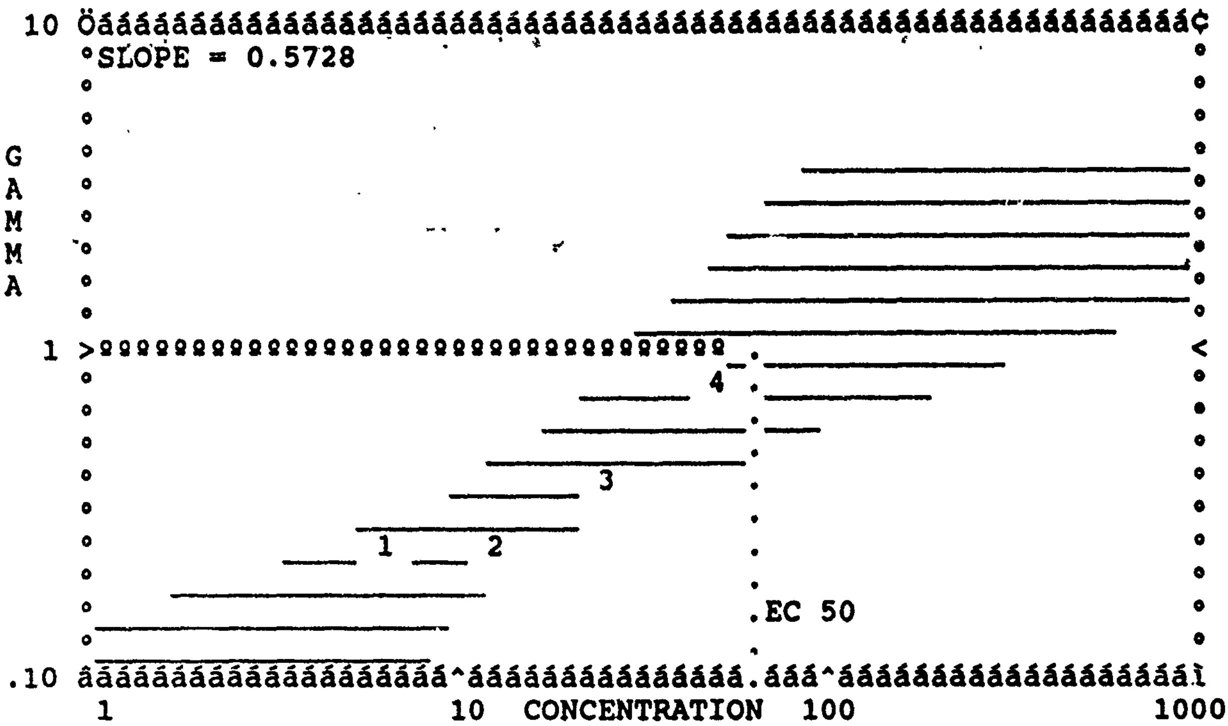
Sample Description:
Appendix I25, pH3, filtered, pHo

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	81/ 46	5.6250	0.28063
2	79/ 44	11.2500	0.30579
3	76/ 39	22.5000	0.41725
4	77/ 30	45.0000	0.86667

BLANK B0/BT = 88/ 64 BLANK RATIO = 0.7273



EC 50 = 65.18 % (95% CONFIDENCE RANGE: 9.76 TO 435.46)

TOXICITY UNITS = 1.5 (95% CONFIDENCE RANGE IS 0.2 TO 10.2)

MICROTOX DATA REPORT

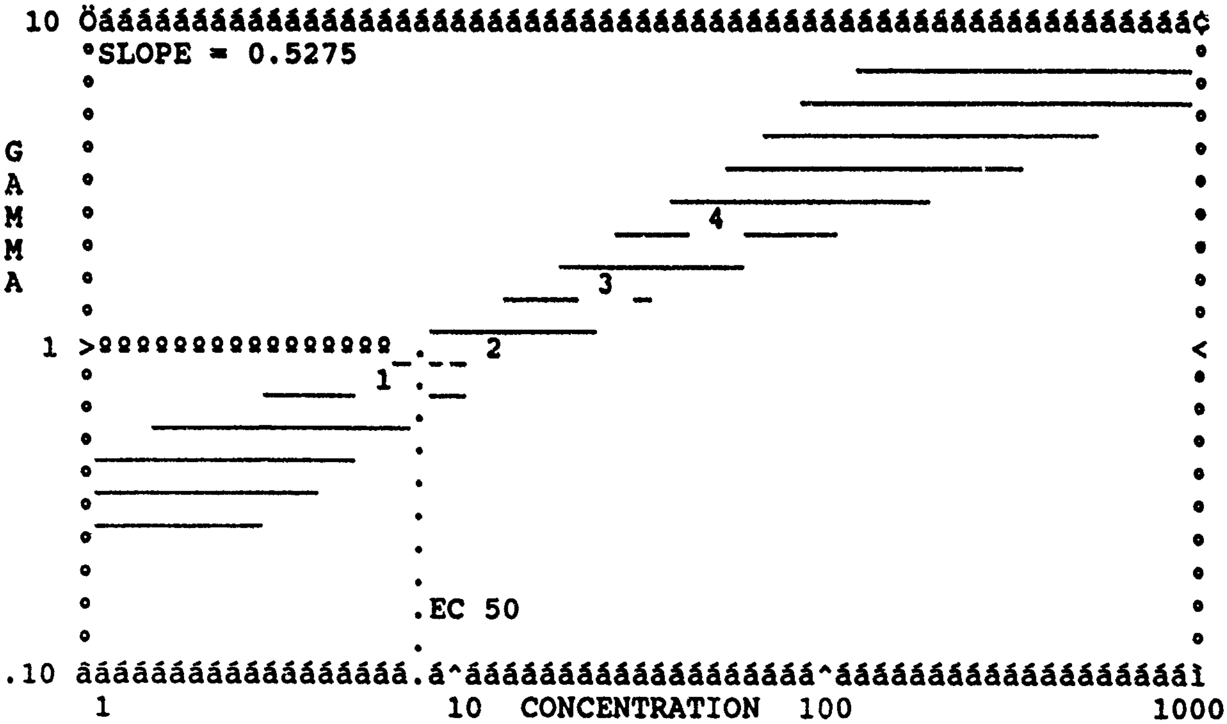
FILE NAME: i26.05 REPORT DATE: 10-09-1991
TIME: 00:04:14

Sample Description:
Appendix I26, pHo filtered

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	80/ 37	5.6250	0.95866
2	81/ 35	11.2500	1.09647
3	81/ 27	22.5000	1.71765
4	82/ 20	45.0000	2.71412
BLANK BO/BT =	85/ 77	BLANK RATIO = 0.9059	



EC 50 = 7.62 % (95% CONFIDENCE RANGE: 3.76 TO 15.44)

TOXICITY UNITS = 13.1 (95% CONFIDENCE RANGE IS 6.5 TO 26.6)

MICROTOX DATA REPORT

FILE NAME: i27.05 REPORT DATE: 10-09-1991
TIME: 00:05:15

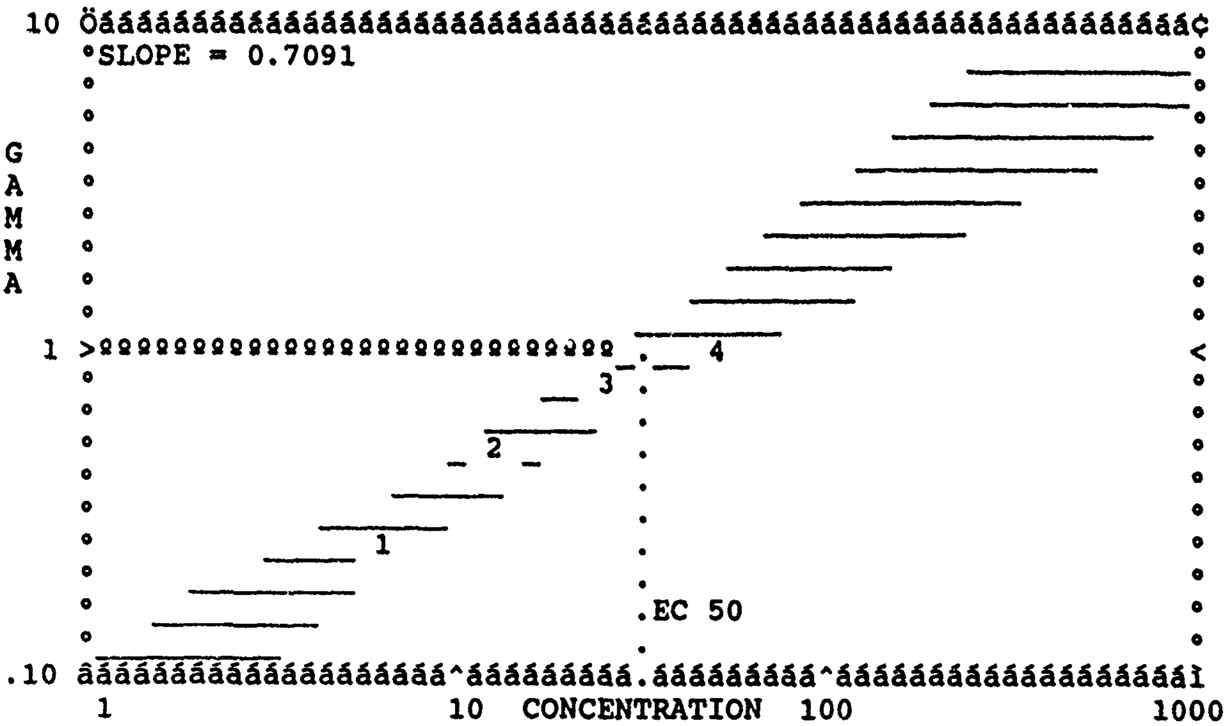
Sample Description:
Appendix I27, pH11, aerated, pHo

Procedure: standard
Initial Concentration : 45 %
Assay Time: 5 minutes

Ionic Adjustment: moas
Dilution Factor : 2
Concentration Units: %

DIL.#	IO/IT	CONC.	GAMMA
1	103/ 55	5.6250	0.28269
2	100/ 44	11.2500	0.55666
3	107/ 40	22.5000	0.83219
4	102/ 31	45.0000	1.25365

BLANK BO/BT = 73/ 50 BLANK RATIO = 0.6849



EC 50 = 29.91 % (95% CONFIDENCE RANGE: 19.82 TO 45.13)

TOXICITY UNITS = 3.3 (95% CONFIDENCE RANGE IS 2.2 TO 5.0)

APPENDIX J

POTW EXPERT REPORTS

Name of POTW: SHEPPARD AFB
Date of Evaluation: Jun 5, 1991
Name of Evaluator: LT THOMPKINS

POTW EXPERT -- MAJOR UNIT PROCESS REPORT

Unit processes are evaluated with respect to their capacity to handle current loadings, and to assess their potential capacity. The ability of the facility to handle the current loadings was assessed and the plant was categorized Type 1, 2, or 3 as described below:

Type 1: Unit processes are adequate
Type 2: Unit processes are marginal
Type 3: Unit processes are inadequate

The point score system for a FixedFilm POTW is as follows;

	POINTS SCORED	POINTS REQUIRED Type 1	Type 2	Type 3
"Aerator"	7	17-23	0-16	< 0
Secondary Clarifier	17	17-30	0-16	< 0
Sludge Handling	-10	10-30	0-9	< 0
Total	14	45-83	15-44	< 15

The results of the unit processes evaluation indicate that the overall rating for this POTW is Type 3. A POTW is considered to be a Type 3 plant if the total points scored is less than the minimum required points for a Type 2 plant or any major unit process scores a negative value (e.g., Type 3).

"AERATOR"

POTW Expert's evaluation indicates that the "Aerator" is Type 2 with a point score of 7. This is based upon the following data:

CURRENT OPERATING CONDITION	POINTS
BOD5 Loading: 22 lb/d/1,000 cu ft	Freezing Temp 11
Recirculation, ratio to raw flow: 1.1:1	2

Anaerobic Sidestreams: Returned to Processes Proceeding Fixed Film Process	-6

SECONDARY CLARIFIER

POTW Expert's evaluation indicates that the Secondary Clarifier is Type 1 with a point score of 17. This is based upon the following:

CURRENT OPERATING CONDITION	POINTS
Configuration: Rectangular with 20% covered with launders	0
Surface Overflow Rate: 268 gpd/sq ft	15
Depth at Weirs: 9 ft	2

SLUDGE HANDLING SYSTEM

POTW Expert's evaluation indicates that the Sludge Handling system is Type 3 with a point score of -10. This is based upon the following data:

SLUDGE PRODUCTION INFORMATION

The primary sludge mass produced is 4,170 lbs per day, with a volume of 10,000 gpd.

The secondary sludge mass is 364 lbs per day, with a volume of 2,183 gpd.

Variations in sludge production values have been observed throughout the year. Additionally, operational decisions to lower sludge inventories in the plant place increased requirements on the sludge handling facilities. It is not uncommon for these variations to require 125-150 percent of the long-term average sludge production value. For this reason, a factor of 1.25 is applied to the calculated sludge mass and volume values to ensure reliable capability under most operational situations throughout the year.

SLUDGE UNITS	PERCENTAGE OF PROJECTED REQUIRED CAPACITY	
	INITIAL*	POTENTIAL**
AnaerobicDigester	19%	19%

DryingBe ; transfer of excess to hauling adds 64%	3%	67%
Hauling	357%	357%

* Initial projected capacity is based upon existing unit operation. It does not take into account operational options (e.g., increased operating time, use of polymers) which might improve the capacity.

** Potential projected capacity represents an extension of the initial capacity by including operational enhancements.

Limiting Unit: AnaerobicDigester

CURRENT OPERATING CONDITION	POINTS
Capacity:	
19% of calculated sludge production	-10

POTW EXPERT -- OBSERVATION REPORT

This report summarizes current observations, highlights potential performance factors, and assists in further refining interview questions.

This is a Type 3 plant. A Type 3 plant indicates that existing major unit processes are inadequate, performance cannot be expected to improve significantly until physical limitations of the major unit processes are eliminated. Since adequate capability does not exist, it is recommended that decisions regarding operational factors limiting performance be moderated.

Influent Values Comparison

	Design	Reported	Projected*	Selected
Flow, gallons	3,000,000	789,000	950,000	789,000
BOD5, mg/l	0	235	260	235
TSS, mg/l	0	750	235	750

* POTW Expert developed the projected data based on an analysis of contribution by the given population and known industrial sources.

SECONDARY SLUDGE ACCOUNTABILITY SUMMARY

No sludge accountability analysis is possible as it is impossible to obtain a reasonable estimate for the wasted secondary sludge from the available data.

PLANT OBSERVATIONS

Organic and Hydraulic Loading:

The reported BOD5 loading of 1,546 lbs per day is within acceptable ranges for the population, 9,500 persons, (e.g., +/- 20% of 0.18 lb BOD5 per capita per day).

The reported removal of BOD from the primary clarifier appears adequate.

The reported flow of 789,000 gpd is within acceptable ranges for the population served (e.g., +/- 30% of 100 gallons per capita per day).

TSS Loading - The 4,935 lb/day reported TSS is at least 30% greater than the plant's 1,546 lb/day organic loading.

This may be due to:

a break in the sewer line allowing excess grit to enter system.

The reported removal of suspended solids from the primary clarifier appears adequate.

Plant Design:

This Aerator is rated Type 2. Based on an overall assessment however, the following parameter(s) used for scoring the capability of the Aerator is considered marginal and may contribute to its undesirable performance:

Anaerobic Sidestreams:
Returned to Processes Proceeding Fixed Film Process

Sludge:

Given the excess capacity of Hauling, POTW Expert has assumed that enough sludge can be hauled to ultimate disposal without drying to allow DryingBeds to operate at a Type 2 level.

The sludge pumping removal mass from the primary clarifier 4,170 lb/day is satisfactory since it is comparable to the suspended solids 4,590 lb/day removal mass. For purposes of the evaluation POTW Expert will use the suspended solids removal mass since it is typically a more accurate value than mass removed based on sludge pumping data. This result will be utilized in conjunction with secondary sludge to evaluate the sludge handling unit processes.

Adequate records must be maintained for wasted sludge volume in order to follow proper mass control principles.

Recirculation from the final clarifier to the influent of the fixed film process is available and in use in this POTW. This type of recirculation can cause excessive hydraulic loading to the final clarifier. The hydraulic impact is projected to outweigh any benefits of recirculation.

DryingBeds is projected to be only capable of providing marginal treatment.

AnaerobicDigester is projected to be only capable of providing marginal treatment.

The sludge accountability analysis indicates an excess of sludge produced beyond that indicated by the recorded wasting. This can indicate problems in performance monitoring.

Sampling and/or volume measurements of wasted sludge is not practical. This may be due to design limitations of the plant and/or lack of understanding as to the importance of monitoring secondary sludge.

Data to calculate sludge wasting from the secondary clarifier(s) are unavailable. Based on a unit sludge production of 0.9 lb TSS per lb BOD5 removed for your Trickling Filter facility, and an effluent quality of 9 mg/l BOD5 and 8 mg/l TSS, POTW Expert will calculate a projected sludge wasting from the secondary process.

This result in conjunction with primary sludge will be used to evaluate the capability of sludge handling processes.

Performance Assessment:

This plant has been in violation of its monthly TSS Permit requirement for 1 out of 12 months.

Plant Maintenance:

Based on your evaluation, existing plant equipment was observed to be functioning properly in a reliable and consistent manner. It appears that no maintenance factors adversely affect the plant's performance.

Plant Administration:

The major unit process evaluation of the POTW indicates that it is Type 3. Although other limiting factors may exist, performance cannot be expected to improve significantly until physical limitions of major unit processes are eliminated. Planning for modifications of existing facilities and/or additional wastewater treatment facilities should be under way. This community has not initiated planning activities for future facilities.

Salary data concerning the Superintendent was not entered. The anticipated pay scale for this position, in this geographic zone is, $23,154 - $28,300 (1989 WPCF - Wastewater Operations Personnel Survey).

Salary data concerning the Operations Supervisor was not entered. The anticipated pay scale for this position, in this geographic zone is, $20,303 - $24,815 (1989 WPCF - Wastewater Operations Personnel Survey).

The salary, $25,000, for the Key Operator is above the anticipated pay scale, $18,443 - $22,541 for this geographic zone (1989 WPCF - Wastewater Operations Personnel Survey).

Missing data for the values of design influent BOD5 concentration and design influent TSS concentration indicates a general lack of familiarity with plant needs and potentials.

The lack of the values of design influent BOD5 concentration and design influent TSS concentration and of the value for the full capacity population of this plant indicates that data necessary for proper planning practices are unavailable.

POTW EXPERT — POTENTIAL PERFORMANCE LIMITING FACTORS
PRELIMINARY SUMMARY

Plant Name: SHEPPARD AFB
CPE Performed by: LT THOMPKINS
Date: Jun 5, 1991

Plant Type:
This is a FixedFilm POTW with a Trickling Filter secondary treatment process.

Design Flow: 3,000,000 gpd
Actual Flow: 789,000 gpd

Plant Performance Summary:

Design Flow:	3,000,000 gpd
Actual Flow:	789,000 gpd

Plant Performance Summary:

This plant has reportedly met all of its BOD5 Permit requirements during the past year.

This plant has been in violation of its TSS Permit requirement for 1 out of 12 months.

FACTORS

The following list of performance limiting factors is based upon the evaluator's careful review and modification of those factors identified by POTW Expert.

Factors which have a "NR" rating were originally identified by POTW Expert and later eliminated from the list by the evaluator. Multiple factors may be triggered by a single observation and in some cases may require re-classification and/or deletion from the list.

Ratings	Factors
A	OPERATION - APPLICATIONS OF CONCEPTS AND TESTING TO PROCESS CONTROL
A	DESIGN - UNIT ADEQUACY - "AERATOR"
A	DESIGN - UNIT ADEQUACY - SLUDGE TREATMENT
A	OPERATION - TESTING - PERFORMANCE MONITORING
B	DESIGN - UNIT ADEQUACY - SLUDGE DEWATERING
B	DESIGN - MISCELLANEOUS - PROCESS ACCESSIBILITY FOR SAMPLING
B	OPERATIONAL - TESTING - PROCESS CONTROL TESTING
C	OPERATIONAL - TECHNICAL GUIDANCE
C	ADMINISTRATION - PLANT ADMINISTRATORS - PLANNING
C	DESIGN - UNIT DESIGN ADEQUACY - PRELIMINARY
NR	DESIGN - PLANT LOADING - RETURN STREAM PROCESS

POTW EXPERT — PERFORMANCE LIMITING FACTORS REPORT

CLASSIFIED PERFORMANCE LIMITING FACTORS

The following factors have been determined to be either A, B, or C rated performance limiting factors. They have not been prioritized within the classes of A, B, and C.

POTENTIAL A FACTORS

Each factor listed below received an "A" rating indicating that the factor potentially has a major effect on a long-term, repetitive basis.

OPERATION - APPLICATIONS OF CONCEPTS AND TESTING TO PROCESS CONTROL

The evaluation indicates that the staff is deficient in their knowledge of wastewater treatment and/or interpretation of process control testing such that improper process control adjustments are made.

Recirculation from the final clarifier to the influent of the fixed film process is available and in use in this POTW. This type of recirculation can cause excessive hydraulic loading to the final clarifier. The hydraulic impact is projected to outweigh any benefits of recirculation.

TSS Loading - The 4,935 lb/day reported TSS is at least 30% greater than the plant's 1,546 lb/day organic loading.

This may be due to:

a break in the sewer line allowing excess grit to enter system.

Sampling and/or volume measurements of wasted sludge is not practical. This may be due to design limitations of the plant and/or lack of understanding as to the importance of monitoring secondary sludge.

DESIGN - UNIT ADEQUACY - "AERATOR"

This factor is cited because the evaluation indicates that the type, size, shape of the "aerator" (basin, RBC, ABF, Trickling Filter, Aerated Stabilization Pond) may hinder its ability to adequately treat the wastewater and provide for stable operation.

This Aerator is rated Type 2. Based on an overall assessment however, the following parameter(s) used for scoring the capability of the Aerator is considered marginal and may contribute to its undesirable performance:

Anaerobic Sidestreams:
Returned to Processes Proceeding Fixed Film Process

DESIGN - UNIT ADEQUACY - SLUDGE TREATMENT

The evaluation indicates that the type, size, shape of the sludge treatment process hinders sludge wasting capability and treatment such that performance is adversely affected.

AnaerobicDigester is projected to be only capable of providing marginal treatment.

OPERATION - TESTING - PERFORMANCE MONITORING

The sludge accountability analysis indicates an excess of sludge produced beyond that indicated by the recorded wasting. This can indicate problems in performance monitoring.

POTENTIAL B FACTORS

Each factor listed below received a "B" rating indicating that the factor potentially has a minimum effect on a routine basis or a major effect on a periodic basis.

DESIGN - UNIT ADEQUACY - SLUDGE DEWATERING

This factor is cited because the evaluation indicates that the type, size, shape of the sludge dewatering process hinders sludge wasting capability or sludge treatment such that performance is adversely affected.

DryingBeds is projected to be only capable of providing marginal treatment.

DESIGN - MISCELLANEOUS - PROCESS ACCESSIBILITY FOR SAMPLING

The inaccessibility of various process flow streams (e.g., recycle streams) for sampling prevent needed information from being obtained.

Sampling and/or volume measurements of wasted sludge is not practical. This may be due to design limitations of the plant and/or lack of understanding as to the importance of monitoring secondary sludge.

OPERATIONAL - TESTING - PROCESS CONTROL TESTING

This POTW is considered a small facility. Process control testing should be performed a minimum of 3 times per week. Operators are not meeting this requirement. Thus, the absence or the timeliness of certain process control testing (e.g., mass control, measurements of DO, RAS flow rate, settling rates, blanket depth) for this plant causes improper operational control decisions to be made.

Adequate records must be maintained for wasted sludge volume in order to follow proper mass control principles.

Data to calculate sludge wasting from the secondary clarifier(s) are unavailable. Based on a unit sludge production of 0.9 lb TSS per lb BOD5 removed for your Trickling Filter facility, and an effluent quality of 9 mg/l BOD5 and 8 mg/l TSS, POTW Expert will calculate a projected sludge wasting from the secondary process.

This result in conjunction with primary sludge will be used to evaluate the capability of sludge handling processes.

Sampling and/or volume measurements of wasted sludge is not practical. This may be due to design limitations of the plant and/or lack of understanding as to the importance of monitoring secondary sludge.

POTENTIAL C FACTORS

Each factor listed below received a "C" rating indicating that the factor potentially has a minor effect on plant performance.

OPERATIONAL - TECHNICAL GUIDANCE

Sources outside the plant (e.g., design engineer, equipment representative, state trainer or inspector) are influential in directing the process control of this facility.

If this guidance adversely affects plant performance you may want to consider citing this as a factor.

ADMINISTRATION - PLANT ADMINISTRATORS - PLANNING

The lack of long range plans for facilty replacement, emergency response, etc. adversely impacts the plant performance.

The lack of the values of design influent BOD5 concentration and design influent TSS concentration and of the value for the full capacity population of this plant indicates that data necessary for proper planning practices are unavailable.

The major unit process evaluation of the POTW indicates that it is Type 3. Although other limiting factors may exist, performance cannot be expected to improve significantly until physical limitions of major unit processes are eliminated. Planning for modifications of existing facilities and/or additional wastewater treatment facilities should be under way. This community has not initiated planning activities for future facilities.

DESIGN - UNIT DESIGN ADEQUACY - PRELIMINARY

Design features of preliminary treatment unit may cause problems in downstream equipment or processes which lead to degraded plant performance.

This factor is cited because the accuracy of the flow measuring device is suspect based on a comparison of the totalizer recorded volume and the hand-measured flume/weir volume.

NOT RATED FACTORS

Each factor listed below was cited by POTW Expert as a factor that potentially has a effect on plant performance. By eliminating this factor from the list of performance limiting factors, the evaluator has indicated that this factor has no adverse effect on plant performance.

DESIGN - PLANT LOADING - RETURN STREAM PROCESS

Excessive volume or highly organic or toxic return process flow stream causes adverse effects on process performance.

TSS Loading - The 4,935 lb/day reported TSS is at least 30% greater than the plant's 1,546 lb/day organic loading.

This may be due to:

a break in the sewer line allowing excess grit to enter system.

Classification System for Prioritizing Performance-Limiting Factors

Rating	Adverse Effect of Factor on Plant Performance
A	Major effect on long-term repetitive basis
B	Minimum effect on routine basis or major effect on a periodic bases
C	Minor effect

APPENDIX K

STORM WATER SAMPLING RESULTS

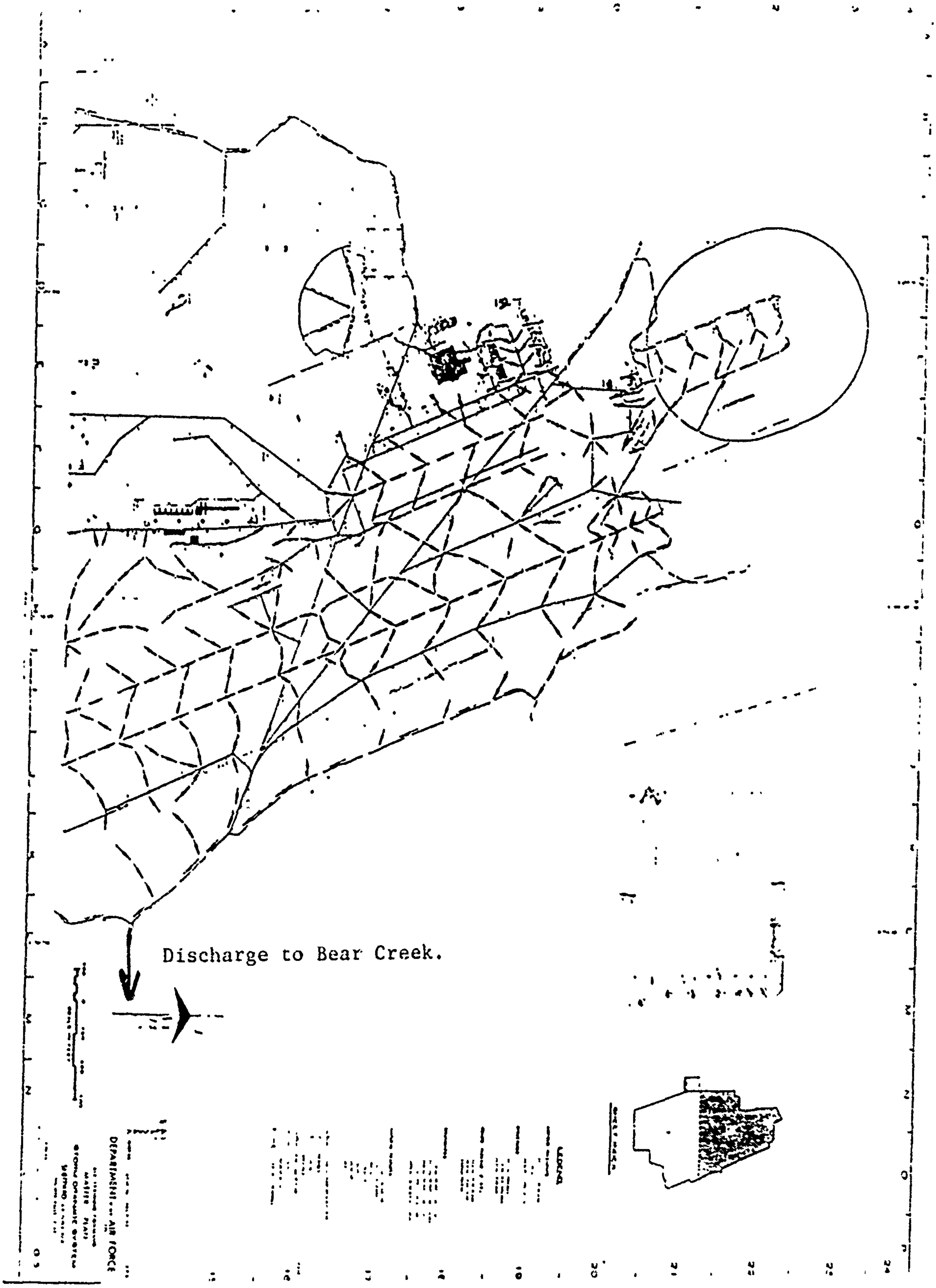


Figure K-1. Drainage map of north side of Sheppard AFB, showing discharge to Bear Creek.

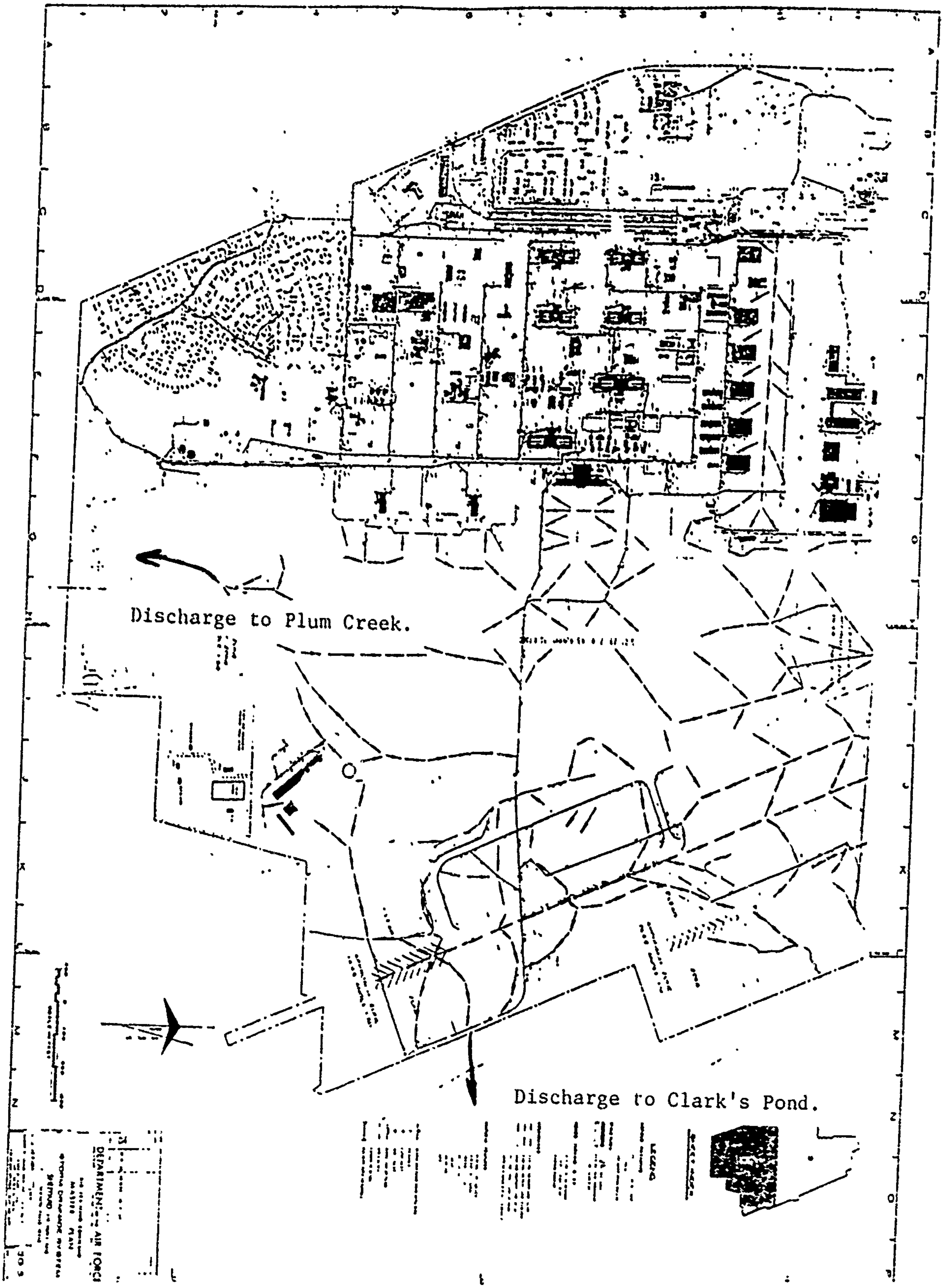


Figure K-2. Drainage map of south side of Sheppard AFB, shoving discharge to unnamed tributary to Clark's Pond and Plum Creek.

Table K-1, Calculation of Volumetric Flow Rate, Unnamed Tributary to Plum Creek SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
Elapsed Time after Initial Grab Sample (hr)	Average Cross-Sectional Area of Water in Pipe (sq ft)	Average Measured Velocity (ft/sec)	Average Volumetric Flow (cu ft/sec)	Percent of Total Flow (%)
1	11	4.7	51.7	33
2	14	4.2	58.8	37
3	17.1	2.8	47.9	30
		Total:	158.4	

Table K-2, Calculation of Volumetric Flow Rate, Bear Creek Exit SHEPPARD AFB WASTEWATER CHARACTERIZATION SURVEY 22 APRIL - 03 MAY 1991				
Elapsed Time after Initial Grab Sample (hr)	Average Depth of Water in Creek (ft)	Average Measured Velocity (ft/sec)	Average Volumetric Flow (cu ft/sec)	Percent of Total Flow (%)
1	3.8	1.53	140	34
2	4.7	1.2	136	33
3	4.7	1.2	136	33
		Total:	412	

TABLE K-3, Results of Storm Water Sampling, Clark's Pond (Page 1 of 2) SHEPPARD AFB WASTEWATER SURVEY 22 APRIL - 03 MAY 1991			
		Literature	
ANALYTE	UNITS	Value*	RESULT
Phenol	ug/l		42
Residue, Filterable	mg/l	100-10,000	178
Residue, Nonfilterable	mg/l		102
Residue, Settleable	mg/l		1
Residue, Total	mg/l		235
Residue, Volatile	mg/l		84
Surfactants - MBAS	mg/l		<0.1
Chemical Oxygen Demand	mg/l	20-600	43
Ammonia	mg/l		0.2
Kjeldahl Nitrogen	mg/l		1.6
Nitrates (as N)	mg/l	3-10	<0.1
Nitrites (as N)	mg/l		<0.02
Phosphorus	mg/l	0.6	0.65
Cyanide (Total)	mg/l		<0.005
Biochemical Oxygen Demand	mg/l	10-250	6
Oils and Grease	mg/l		0.3
Arsenic	ug/l		<10
Barium	ug/l		<100
Boron	ug/l		1000
Cadmium	ug/l		13
Chromium	ug/l		<50
Chromium VI	ug/l		<50
Copper	ug/l		<20
Iron	ug/l		635
Lead	ug/l	350	<20
Magnesium	mg/l		6.46
Manganese	ug/l		116
Mercury	ug/l		1.0
Nickel	ug/l		<50
Silver	ug/l		<10
Zinc	ug/l		<50

* From Novotny and Chesters (7).

TABLE K-3, Results of Storm Water Sampling, Clark's Pond (Page 2 of 2)
SHEPPARD AFB WASTEWATER SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS	RESULT
1,3-Dichlorobenzene	ug/l	<0.5
1,4-Dichlorobenzene	ug/l	<0.7
Ethyl Benzene	ug/l	<0.3
Chlorobenzene	ug/l	<0.6
Toluene	ug/l	<0.3
Benzene	ug/l	<0.5
1,2-Dichlorobenzene	ug/l	<1.0
Bromodichloromethane	ug/l	<0.4
Bromoform	ug/l	<0.7
Carbon Tetrachloride	ug/l	<0.5
Chlorobenzene	ug/l	<0.6
Chloroethane	ug/l	<0.9
Chloroform	ug/l	<0.3
Chloromethane	ug/l	<0.8
Chlorodibromomethane	ug/l	<0.5
1,2-Dichlorobenzene	ug/l	<1.0
1,3-Dichlorobenzene	ug/l	<0.5
1,4-Dichlorobenzene	ug/l	<0.7
Dichlorodifluoromethane	ug/l	<0.9
1,1-Dichloroethane	ug/l	<0.4
1,2-Dichloroethane	ug/l	<0.3
1,1-Dichloroethene	ug/l	<0.3
trans-1,2-Dichloroethene	ug/l	<0.5
1,2-Dichloropropane	ug/l	<0.3
cis-1,3-Dichloropropene	ug/l	<0.5
trans-1,3-Dichloropropene	ug/l	<0.5
Methylene Chloride	ug/l	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5
Tetrachloroethylene	ug/l	<0.6
1,1,1-Trichloroethane	ug/l	<0.5
1,1,2-Trichloroethane	ug/l	<0.5
Trichloroethylene	ug/l	<0.5
Trichlorofluoromethane	ug/l	<0.4
Vinyl Chloride	ug/l	<0.9
Bromomethane	ug/l	<0.9
2-Chloroethylvinyl ether	ug/l	<0.9

TABLE K-4, Results of Storm Water Sampling,
Golf Course Discharge into Plum Creek (Page 1 of 2)
SHEPPARD AFB WASTEWATER SURVEY
22 APRIL - 03 MAY 1991

ANALYTE	UNITS	Literature Value*	Initial 30 min.	3-hour Composite
Phenol	ug/l		12	20
Residue, Filterable	mg/l	100-10,000	146	66
Residue, Nonfilterable	mg/l		25	134
Residue, Settleable	mg/l		<0.2	1
Residue, Total	mg/l		301	279
Residue, Volatile	mg/l		78	56
Surfactants - MBAS	mg/l		<0.1	0.3
Chemical Oxygen Demand	mg/l	20-600	60	<10.0
Ammonia	mg/l		1.5	0.46
Kjeldahl Nitrogen	mg/l		3.9	1.5
Nitrates (as N)	mg/l	3-10	<0.1	0.33
Nitrites (as N)	mg/l		<0.02	<0.02
Phosphorus	mg/l	0.6	0.48	0.47
Cyanide (Total)	mg/l		<0.005	<0.005
Biochemical Oxygen Demand	mg/l	10-250	11	6
Oils and Grease	mg/l		1	<0.3
Arsenic	ug/l		<10	<10
Barium	ug/l		<100	160
Boron	ug/l		700	500
Cadmium	ug/l		10	<10.0
Chromium	ug/l		<50	<50
Chromium VI	ug/l		<50	<50
Copper	ug/l		<20	<20
Iron	ug/l		381	665
Lead	ug/l	350	<20	33
Magnesium	mg/l		3.56	2.08
Manganese	ug/l		70	166
Mercury	ug/l		<1.0	<1.0
Nickel	ug/l		<50	<50
Silver	ug/l		<10	<10
Zinc	ug/l		<50	<50

* From Novotny and Chesters (7).

TABLE K-4, Results of Storm Water Sampling, Golf Course Discharge into Plum Creek (Page 2 of 2) SHEPPARD AFB WASTEWATER SURVEY 22 APRIL - 03 MAY 1991			
ANALYTE	UNITS	Initial 30 min.	3-hour Composite
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6
Toluene	ug/l	<0.3	<0.3
Benzene	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0
Bromodichloromethane	ug/l	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9
Chloroform	ug/l	1.8	0.5
Chloromethane	ug/l	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3
trans-1,2-Dichloroethene	ug/l	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3
cis-1,3-Dichloropropene	ug/l	<0.5	<0.5
trans-1,3-Dichloropropene	ug/l	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9
2-Chloroethylvinyl ether	ug/l	<0.9	<0.9

TABLE K-5, Results of Storm Water Sampling, Bear Creek Exit (Page 1 of 2) SHEPPARD AFB WASTEWATER SURVEY 22 APRIL - 03 MAY 1991				
ANALYTE	UNITS	Literature Value*	Initial 30 min.	3-hour Composite
Phenol	ug/l		91	38
Residue, Filterable	mg/l	100-10,000	732	90
Residue, Nonfilterable	mg/l		72	84
Residue, Settleable	mg/l		<0.2	0.9
Residue, Total	mg/l		367	359
Residue, Volatile	mg/l		108	66
Surfactants - MBAS	mg/l		<0.1	<0.1
Chemical Oxygen Demand	mg/l	20-600	43	25
Ammonia	mg/l		0.32	0.29
Kjeldahl Nitrogen	mg/l		1.6	2.2
Nitrates (as N)	mg/l	3-10	<0.1	<0.1
Nitrites (as N)	mg/l		<0.02	<0.02
Phosphorus	mg/l	0.6	4	0.56
Cyanide (Total)	mg/l		<0.005	<0.005
Biochemical Oxygen Demand	mg/l	10-250	11	6
Oils and Grease	mg/l		3.4	0.8
Arsenic	ug/l		<10	<10
Barium	ug/l		180	<100
Boron	ug/l			2500
Cadmium	ug/l		13	<10.0
Chromium	ug/l		<50	<50
Chromium VI	ug/l		<50	<50
Copper	ug/l		29	<20
Iron	ug/l		2787	654
Lead	ug/l	350	23	<20
Magnesium	mg/l		14.53	2.61
Manganese	ug/l		793	158
Mercury	ug/l		<1.0	<1.0
Nickel	ug/l			<50
Silver	ug/l		<10	<10
Zinc	ug/l		143	<50

*From Novotny and Chesters (7).

TABLE K-5, Results of Storm Water Sampling, Bear Creek Exit (Page 2 of 2) SHEPPARD AFB WASTEWATER SURVEY 22 APRIL – 03 MAY 1991			
ANALYTE	UNITS	Initial 30 min.	3-hour Composite
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Ethyl Benzene	ug/l	<0.3	<0.3
Chlorobenzene	ug/l	<0.6	<0.6
Toluene	ug/l	<0.3	<0.3
Benzene	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0
Bromodichloromethane	ug/l	<0.4	<0.4
Bromoform	ug/l	<0.7	<0.7
Carbon Tetrachloride	ug/l	<0.5	<0.5
Chlorobenzene	ug/l	<0.6	<0.6
Chloroethane	ug/l	<0.9	<0.9
Chloroform	ug/l	<0.3	<0.3
Chloromethane	ug/l	<0.8	<0.8
Chlorodibromomethane	ug/l	<0.5	<0.5
1,2-Dichlorobenzene	ug/l	<1.0	<1.0
1,3-Dichlorobenzene	ug/l	<0.5	<0.5
1,4-Dichlorobenzene	ug/l	<0.7	<0.7
Dichlorodifluoromethane	ug/l	<0.9	<0.9
1,1-Dichloroethane	ug/l	<0.4	<0.4
1,2-Dichloroethane	ug/l	<0.3	<0.3
1,1-Dichloroethene	ug/l	<0.3	<0.3
trans-1,2-Dichloroethene	ug/l	<0.5	<0.5
1,2-Dichloropropane	ug/l	<0.3	<0.3
cis-1,3-Dichloropropene	ug/l	<0.5	<0.5
trans-1,3-Dichloropropene	ug/l	<0.5	<0.5
Methylene Chloride	ug/l	<0.4	<0.4
1,1,2,2-Tetrachloroethane	ug/l	<0.5	<0.5
Tetrachloroethylene	ug/l	<0.6	<0.6
1,1,1-Trichloroethane	ug/l	<0.5	<0.5
1,1,2-Trichloroethane	ug/l	<0.5	<0.5
Trichloroethylene	ug/l	<0.5	<0.5
Trichlorofluoromethane	ug/l	<0.4	<0.4
Vinyl Chloride	ug/l	<0.9	<0.9
Bromomethane	ug/l	<0.9	<0.9
2-Chloroethylvinyl ether	ug/l	<0.9	<0.9